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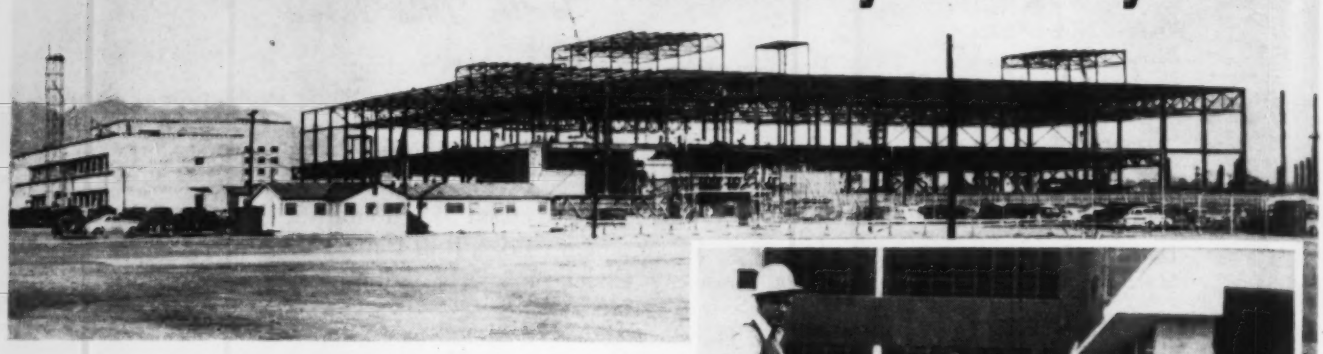
VITRIFIED CLAY PIPE

Handles Tough Assignment

For New G. M. Plant's Sanitary Sewer System



VITRIFIED CLAY PIPE was used exclusively for the sanitary sewer system of General Motor's new $7,500,000 assembly and distributing plant 1½ miles north of Van Nuys, California. Clay Pipe was specified because it is the *only* pipe impervious to the corrosive action and acidity of the industrial wastes to be drained off through the sewer system.

In some places the sewer trenches ranged from 12 feet to 22 feet in depth to get the required fall. The soil is very sandy and subject to seismic conditions. The sewer system runs under railway tracks and roadways where it is subject to extra heavy loads. In these installations, Extra-Strength Clay Pipe was used.

On *any* industrial sewer line installation, it pays to specify Clay Pipe. If you need specific information on Clay Pipe, write the office nearest you.

Eight thousand feet of Vitrified Clay Pipe was used in constructing the new General Motors sanitary sewer system and connecting it with the Los Angeles sewer system. Where extra-heavy loads were encountered, Extra-Strength Clay Pipe was specified. Donald Parkinson of Los Angeles was the architect. The E-L-E Company of Los Angeles were consulting engineers. E. Willardson, Plumbing and Heating Contractor, also of Los Angeles, installed the Clay Pipe. Superintendent on the job was Walter A. Moss.

★ ★ ★

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CLAY PIPE

Panama Canal Symposium to Keynote ASCE Annual Meeting in New York

THE ANNUAL MEETING COMMITTEE welcomes you to New York for the 95th Annual Meeting of the Society. The Hotel Commodore has again been selected as headquarters and the Committee is assured that accommodations for members and their guests will exceed even the high standards of previous years. Of particular interest to those who live outside of New York is the substantial increase in the number of hotel rooms which will be reserved for members. This year we have been able to secure the Century Room at the Commodore for the Ladies Entertainment on Thursday, so that for the first time, all events except excursions will be held at one location. Moreover, the hotel has made available for the use and convenience of the ladies throughout the entire meeting a pleasant and nicely appointed suite of rooms known as the Club Suite. The ladies are invited to make these rooms their headquarters for meeting their friends and for bridge, reading, knitting or just relaxing. Members of the Ladies Committee will be present each day to assist in any way possible.

1948 Annual Meeting Committee
N. M. Quade, Chairman

AS PRINTED in the December issue of CIVIL ENGINEERING, the program of the Ninety-Fifth Annual Meeting contains a number of innovations. One of the outstanding features of the meeting will be the Panama Canal symposium, based on studies made by the Special Engineering Division, which resulted in a recent report by the Governor of the Canal Zone recommending construction of a sea-level canal. Opening the symposium with a general session on Wednesday afternoon, January 21, Col. James H. Stratton, M. ASCE, Supervising Engineer of the Special Engineering Division of the Panama Canal will present an over-all statement of the problem of an improved Panama Canal. The general session will be followed by sessions of the Construction, Hydraulics, Soil Mechanics and Foundations, and Waterways Divisions on Thursday and Friday, January 22 and 23, all devoted to the Panama Canal studies in their particular fields.

In addition to the above-mentioned Division sessions, there will be meetings of the Sanitary Engineering Division, Structural Division, Power Division, Highway Division and City Planning Division, and a joint session of the Air Transport Division and the Soil Mechanics and Foundations Division.

Luncheons

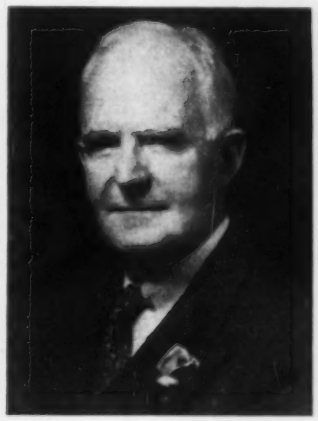
The Wednesday and Thursday luncheons are expected to be of particular interest to many members. At the Wednesday luncheon, the speaker will be William L. Batt, president of SKF Industries whose subject will be "How Engineering Can Aid the European Recovery Plan." The Thursday luncheon, arranged under the auspices of the Construction Division, will feature a number of speakers who will give brief addresses on the outlook in various fields of construction, including D. W. Winkelman, President-elect, Associated General Contractors of America; Carlton S. Proctor, Vice-President, ASCE, Consulting Engineer, New York City; Bernard J. Gilroy, Commissioner of Housing and Buildings, City of New York; Rear Admiral J. J. Manning, M. ASCE, Chief of the Bureau of Yards and Docks; J. P. H. Perry, M. ASCE, Vice-President, Turner Construction Co.; and Prof. Elmer K. Timby, M. ASCE, Member, Executive Committee, Construction Division, ASCE.

The meeting will close on Saturday, January 24, 1948, with a sightseeing boat excursion about New York Harbor and lower Hudson River.

William L. Batt

D. W. Winkelman

J. J. Manning



J. P. H. Perry

SPEAKERS AT ASCE ANNUAL MEETING include William L. Batt, who will address Wednesday luncheon, and D. W. Winkelman, Rear Admiral J. J. Manning, and J. P. H. Perry, scheduled to speak at Thursday luncheon meeting. President of SKF Industries, Inc., for past 25 years, Mr. Batt was in Washington during war as vice-chairman of War Production Board. He is authority on postwar European problems, having been abroad on several official missions. Past-president and honorary member of ASME, he recently presided at 8th International Management Congress in Stockholm. Mr. Winkelman, president of D. W. Winkelman Co., Inc., Syracuse, N. Y., contracting firm, will be installed as president of Associated General Contractors of America at organization's annual convention. Long prominent in AGC activities, he is now completing term as vice-president. Member of Navy Civil Engineer Corps since 1918, Admiral Manning, M. ASCE, has served as director of Atlantic and Eastern Pacific Divisions of Bureau of Yards and Docks, and is now chief of Bureau. J. P. H. Perry, M. ASCE, vice-president of Turner Construction Co., New York, is authority in field of reinforced concrete building construction. ASCE Director from 1933 to 1935, he has been chairman of Society's Construction Division and president of Metropolitan Section.

Rock Riprap Replaces Porous Concrete Slope Protection at Santee-Cooper Project

HENRY H. JEWELL, M. ASCE

Construction Engineer, Bureau of Community Facilities
Federal Works Agency, Washington, D. C.

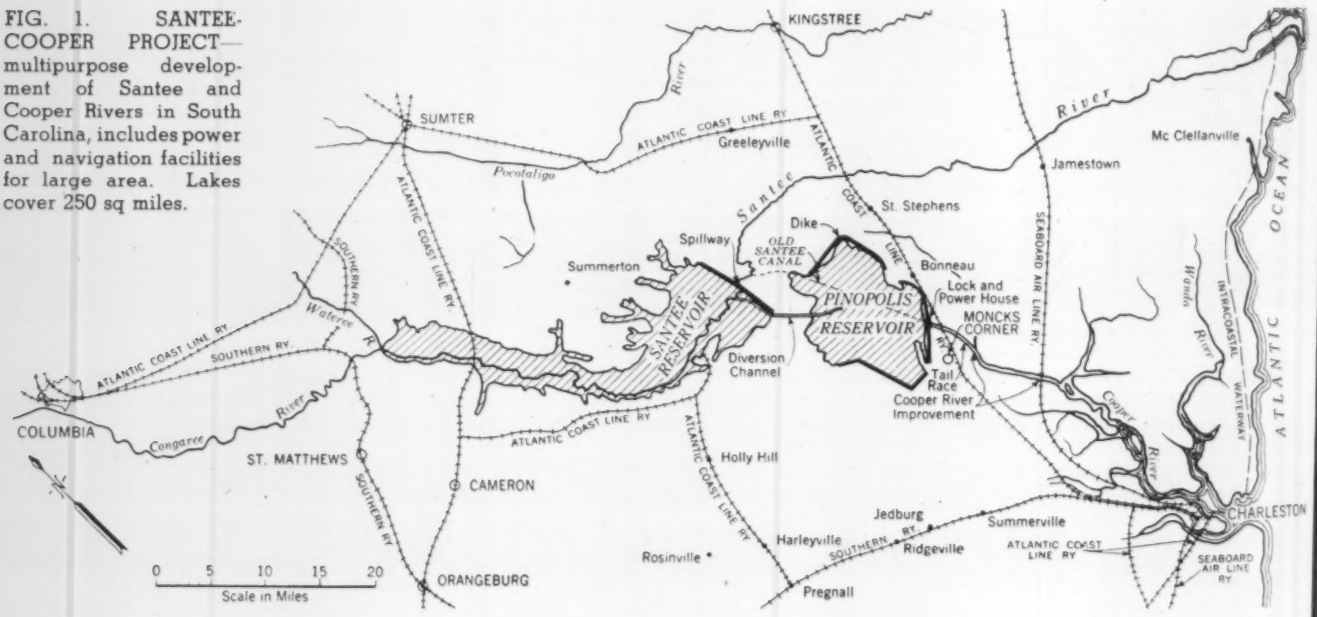
CORRECTIVE SLOPE PROTECTION measures are under way along 11 of the 50 miles of rolled-earth and hydraulic-fill dams and dikes that create lakes with storage capacity of 2,460,000 acre-ft in Santee-Cooper Project between Columbia and Charleston, S.C. Pictured above is spillway of 8-mile-long North Santee Dam across Santee-Cooper swamp. Power plant at Pinopolis Dam, where 75-ft head is developed, has present installation of 130,000 kw with ultimate capacity of 160,000 kw.

THE FAILURE OF POROUS CONCRETE to provide a durable protection for the upstream surface of the dams and dikes of the Santee-Cooper Project, like the failure of concrete-block protection on the Kingsley Dam (see "Protecting Upstream Slope of Kingsley Dam," by Mr. Jewell, in CIVIL ENGINEERING for November 1945), illustrates the need for adequate advance engineering study and the application of tried and tested materials and methods in the design and construction of slope protection for earth dams subject to wave action. Constructed by the South Carolina Public Service Authority, at a cost of $53,625,000 and financed by loan and grant funds of the Public Works Administration, the Santee-Cooper Hydroelectric and Navigation Project (Fig. 1) was placed in operation in 1942 although some of the construction work—principally slope protection, transmission lines and substations—has not yet been completed owing to delays caused by the war and continuing shortages of materials and labor.

EXCEPT FOR THE SPILLWAY, powerhouse and lock sections, all dams and dikes of the Santee-Cooper Hydroelectric and Navigation Project are of earth—either of the rolled-fill or hydraulic-fill type. The Santee Dam has a maximum height of 48 ft and the Pinopolis Dam rises to a maximum of about 80 ft above the marl subsoil. Figure 2 shows a typical cross section of the Santee Dam where the maximum high-water level is at El. 75.0 and the minimum low water (crest of spillway) is at El. 63.0. Operating levels range from about El. 67 to 76.

Upstream slope protection was placed from the berm at El. 55.0 or higher where the natural ground level

FIG. 1. SANTEE-COOPER PROJECT—multipurpose development of Santee and Cooper Rivers in South Carolina, includes power and navigation facilities for large area. Lakes cover 250 sq miles.



was above that elevation, to the crest at El. 88.0. Therefore, the protected slope has a maximum width of about 103 ft measured along the slope, about 41 ft of which is subject to wave action. Protection against wave action has been provided for a total of 39.2 miles of dams and dikes, of which 15.6 miles are protected by a porous concrete slab 10 in. thick on 4 in. of gravel, and the rest, where exposed to wave action, is covered with riprap.

The maximum water distance or "fetch" for which upstream slopes are protected is about 15 miles. The north Santee Dam is partially protected by a fringe of timber left standing in the reservoir which, however, is gradually falling. To prevent slope damage from this source, floatage is removed soon after it reaches shore.

The decision to use porous concrete as the principal slope protection material was reached after study and consideration of many types of materials including reinforced concrete, concrete blocks and rock riprap. The only rock encountered in excavating for the project structures was unsuitable for riprap subjected to heavy wave action and was limited in quantity. The nearest source of durable riprap rock was the granite quarries near Columbia, S.C., requiring rail transportation at a cost then considered prohibitive. Reinforced concrete apparently was rejected because of the possibility of failure due to hydrostatic head from receding waves. Later, after the failure of porous concrete, a reinforced concrete slab was proposed and alternate bids were taken on rock riprap and reinforced concrete.

Wave Action on Porous Concrete Unknown

When porous concrete was selected for slope protection it had been used on the project as a drainage layer under the apron of the Santee spillway. Although it had been extensively used elsewhere for similar drainage purposes, its use as slope protection on an earth dam subject to wave action was a radical departure from known experience.

AFTER TWO YEARS of wave action, inspection of porous concrete slab on slopes of North Santee Dam, below full-reservoir level (El. 75.0), revealed partial or complete erosion to depth of about 2 in. Porous mat reaches from berm at El. 55.0 to crest of dam at El. 88.0. Water surface in photograph is at El. 72.86.

Samples of porous concrete, of several different mix proportions of cement and gravel ($^1/_4$ to $^3/_4$ in.) varying from 1:7 to 1:10, with no sand, were then made and subjected to alternate freezing and thawing tests. The 1:8 specimens showed a loss of about 2 percent in 50 cycles. This latter proportion, requiring 1 bbl of cement per cu yd with aggregate as follows, was adopted for construction:

Not more than 5% retained on $^3/_4$-in. sq screen
40% to 60% retained on $^3/_8$-in. sq screen
82% to 90% retained on No. 4 screen
Not less than 95% retained on No. 8 screen

Slab thickness was designed at 10 in., to be placed on a layer of pea gravel 4 in. thick on the shell of the dam.

A model of this design was tested at the U.S. Waterways Experiment Station at Vicksburg in July 1940, where water was rapidly raised and lowered against the porous concrete to simulate wave action, with pressure gages placed in the slab to indicate uplift pressure. The report of this test showed no significant uplift pressure.

Although admittedly experimental, porous concrete was therefore adopted for upstream slope protection of dams and dikes for the following reasons:

1. It was estimated that porous concrete would cost about $2,000,000 less than any other suitable material.
2. It successfully stood 50 cycles of freezing and thawing tests. (Here it should be noted that ice action is not a factor in the project area as temperatures are seldom so low as to cause even a paper-thin ice sheet along lake shores. Therefore, except for the minor effect of a temporary ice cover from spray and sleet on the slope above water, ice conditions may generally be disregarded.)
3. Tests showed ample compressive strength.
4. Laboratory test of a full-scale model showed that no uplift pressure would occur from receding waves.
5. It was assumed that floatage composed of large trees, logs and stumps would be removed before it could damage the concrete during heavy wave action.

Extensive Use Not Justified

In the light of subsequent experience these reasons do not appear to have presented adequate justification for such very extensive use of this experimental material under conditions as vulnerable as those at Santee-Cooper. The customary conservative engineering pattern appears to have been broken when, after laboratory tests only, decision was reached to use an experimental slope-protection material on more than 15 miles of earth dams to be subjected to wave action from a fetch up to 15 miles, frequently accompanied by the pounding of great masses of large and unusually heavy driftwood.

Two contracts for slope protection in the total amount of $3,672,925, of

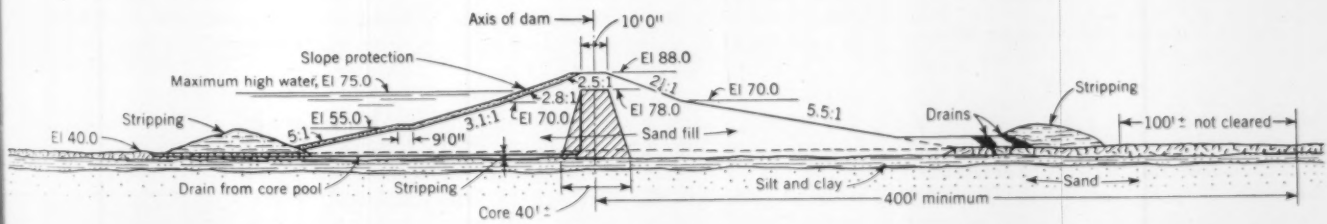
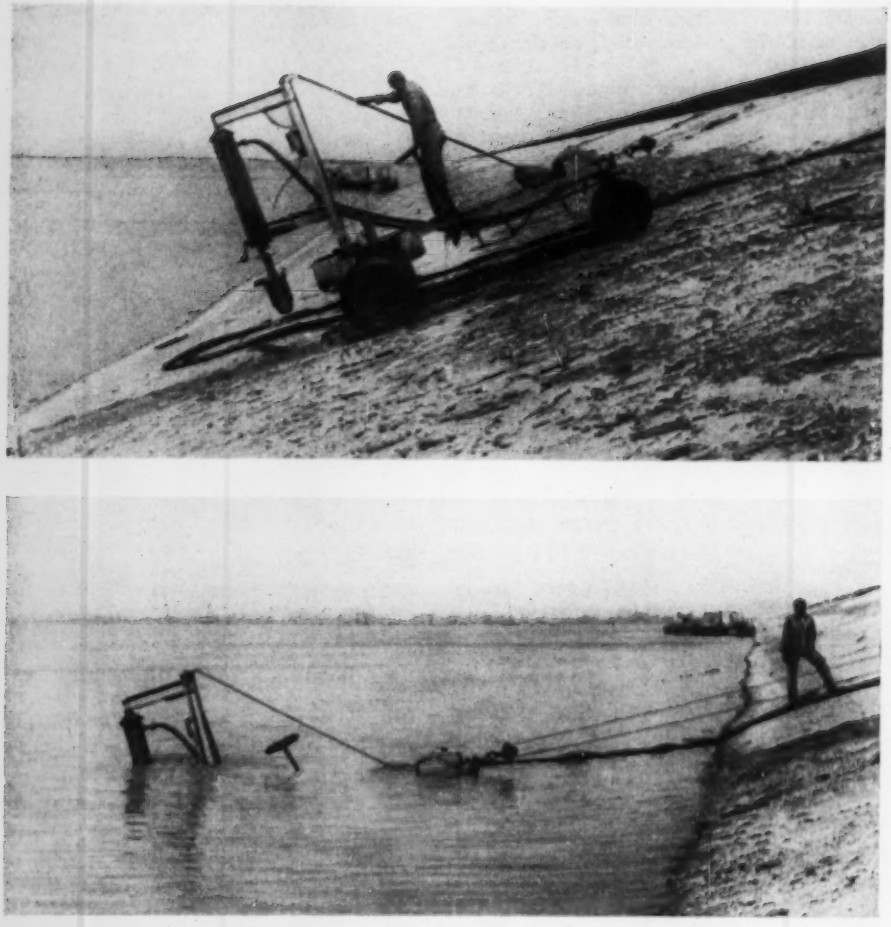


FIG. 2. SECTION THROUGH Santee North Dam shows hydraulic fill with protected slope of about 103 ft (measured along slope), 41 ft of which is subject to wave action. Of total 39.2 miles of dams and dikes, 15.6 miles are protected by 10-in.-thick porous concrete slab on 4 in. of gravel.



PNEUMATIC PAVEMENT BREAKER (top photo) mounted on truck chassis is designed to operate on entire slope, including under-water portion (bottom photo), in breaking 400,000 sq yd of 10-in.-thick porous concrete. Broken mat prevents slippage of new 6- to 12-in. rock filter layer and 24- to 42-in. layer of rock riprap.

which $2,532,752 was for porous concrete and $1,140,173 was for rock riprap on dikes, were completed in July 1942. The reservoirs were filled to maximum capacity for the first time in September 1942. The methods of porous-concrete slope-protection construction for the two reservoirs were quite different. On the Pinopolis Reservoir the concrete was poured in alternate strips 20 ft wide from berm to top with a considerable lapse of time between pours in adjacent strips, while on the Santee Reservoir the concrete was poured continuously except for the interval elapsing between successive days' pours and for interruptions due to weather.

Porous Concrete Fails at Santee Dam

In the summer of 1942 several failures occurred in the porous concrete on the Santee Dam from expansion of the slab which resulted in overthrust shear and crushing extending generally in a transverse direction from below the water line to the crest. Very few cracks of this character have appeared on the Pinopolis Dam where the concrete was poured in alternate 20-ft strips. Cracks continued to appear on the Santee Dam so that it was necessary to adopt a systematic method of repair which generally consisted of cutting out the cracks for a width of about 18 to 24 in. and refilling with solid concrete.

In the spring of 1944 when the reservoirs were full, examination of the porous concrete from maximum water level to crest indicated good condition in that area except for the cracks mentioned above and some signs of deterioration in the wave belt above high-water level. Later in that year when reservoir levels were lowered it was evident that disintegration of the surface below water had commenced. Partial or complete erosion to a depth of about 1 to 2 in. was apparent in most of the area subjected to wave action. Damage was more pronounced on the Santee Dam than on the Pinopolis Dam.

Only after a period of examination, tests and engineering study extending from the fall of 1944 to July 1946, was it possible to secure agreement among engineers of the three agencies concerned, the South Carolina Public Service Authority, the Federal Works Agency and the Federal Power Commission, as to the character and extent of the repairs. Consulting engineers were engaged both by the Authority and by the Federal Works Agency to investigate, report on and recommend remedial measures. In the studies and conferences that followed, so much disagreement occurred among the engineers as to the design and extent of the repair work that it was finally necessary for the three agencies to select a board of consulting engineers to examine and report on the slope protection, whose decision would be accepted as final. Nowhere else in the writer's rather long experience in engineering and construction work has he encountered so much divergence of opinion among competent engineers as to the proper remedy for an engineering failure, the solution of which at first view appeared comparatively simple.

Reconstruction Program Necessary

Differences of opinion first developed as to whether or not any extensive repairs were necessary other than continuance of the repair of cracks on the Santee Dam. As the investigations continued it was tentatively agreed that a reconstruction program was necessary for all porous concrete in the wave belt above low-water elevation. Finally it was decided that the new construction should extend from the submerged berm at El. 55 to 3 ft above full reservoir level, that is, to El. 78. The wisdom of the decision for extensive new construction was borne out by the fact that in February 1947 when stormy weather and extensive driftwood floatage occurred, the condition of the porous concrete became so bad that it was necessary to rapidly lower the water to a level about 5 ft below maximum in order to protect the upstream slopes from further damage. It was then necessary to commence extensive emergency repairs by gunite, although by that time work was already under way on rock riprap protection.

In the fall of 1944 the Authority commenced a program of investigations and tests of the porous concrete. Gunite of several different thicknesses and penetrations was applied to sections of the slab several hundred feet long on the Pinopolis Dam, including panels in which 4-in.-wide strips were left untreated to provide for relief of uplift pressure from receding waves. Heating and cooling tests were applied to the gunite. A hydrostatic-head test was also made by pumping

water into a wooden cofferdam on the slope of the gunite-covered porous concrete slab and observing the rise of water in tubes embedded in the slab at various points below the cofferdam. Results of this latter test were considered inconclusive since it did not duplicate all of the conditions accompanying receding wave action. Eventually gunite was rejected because it was believed that even if reinforced with wire it would not have sufficient permanence and strength to prevent extensive cracking similar to that which had already occurred on the Santee Dam.

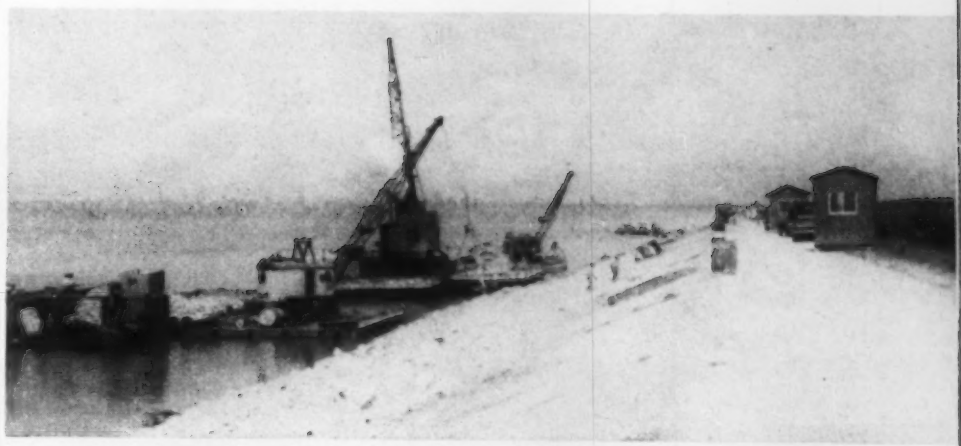
A field investigation, accompanied by core borings and laboratory tests, was made by the U.S. Corps of Engineers under the direction of B. Mather and Charles E. Wuerpel, in November and December 1944. Tests of the cores of porous concrete showed compressive strengths varying from 790 to 2,915 psi. Visual observation of the slab in the upper wave belt showed a loss of cement coating on surface pebbles to a depth of about 2 in. on the Santee Dam. Subsequent tests confirmed earlier indications that removal of cement paste was due to the chemical action of the water, having substantial capacity for solution of calcium carbonate as the water circulated through the voids of the porous concrete.

Porous Concrete Cores Tested

Additional cores of porous concrete taken from the slab below low-water level in May 1945 and May 1946 showed compressive strengths as follows:

Lb per Sq In.		
1945	1946	1946, % of 1945
905	595	66
1,260	1,250	99
1,665	920	55

Tests of the cores from below El. 75 indicated a considerable reduction in compressive strength. In general, there was a reduction in strength to about half that of new porous concrete. The samples from the slab below high water (El. 75) showed a marked change in the character of the cement hydrate as compared with those from above high water. A photograph shows the porous concrete on the North Santee Dam as of October 29, 1946, above water-surface El. 72.86.



FLOATING PLANT PLACES RIPRAP on slope of North Santee Dam by means of cranes and clamshell buckets. Rock from quarry near Congaree River is transported to site by barges and LCT'S.

Laboratory tests of samples of water from the reservoirs showed a low alkalinity with free carbon dioxide up to 23 ppm, resulting in a calcium carbonate demand up to 40 ppm. On the average, each million gallons of water in the Santee Reservoir, which showed the highest $CaCO_3$ demand, has a demand for about 167 lb of calcium carbonate. This demand is of two parts, one due to the carbonic acid action of the carbon dioxide and the other to the calcium deficiency of the water.

Studies of the problem included investigations, tests and photographs of wave action in the laboratory tanks of the Beach Erosion Board, Washington, D.C. An experimental wooden cofferdam with canvas covering extending 20 ft on each side on the porous concrete and down to El. 55, was dewatered to 10 ft below water surface.

Reinforced Concrete Slab Adopted

After the completion of the various field examinations and tests, the majority opinion was that a solid reinforced concrete slab of proper design would withstand the chemical and wave action of the water, although porous concrete had not done so. In the engineering conferences that followed, two types of protective materials, a reinforced concrete slab and rock riprap on a crushed rock or gravel filter layer were finally adopted as suitable. There was much disagreement among the engineers engaged in the solution of the problem as to the following:

1. What should be the thickness of the proposed reinforced concrete slab and the amount of steel reinforcing?
2. What methods should be used for slab construction? Part of this work would have to be done in 4 to 12 ft of water depending on reservoir level. It was not feasible to lower the reservoirs to low-water level during slab construction because of the loss of power production that would result.
3. To what extent were repairs necessary? Should new protection extend as low as the berm at El. 55 or upward from the low-water line only? All agreed that no new protection

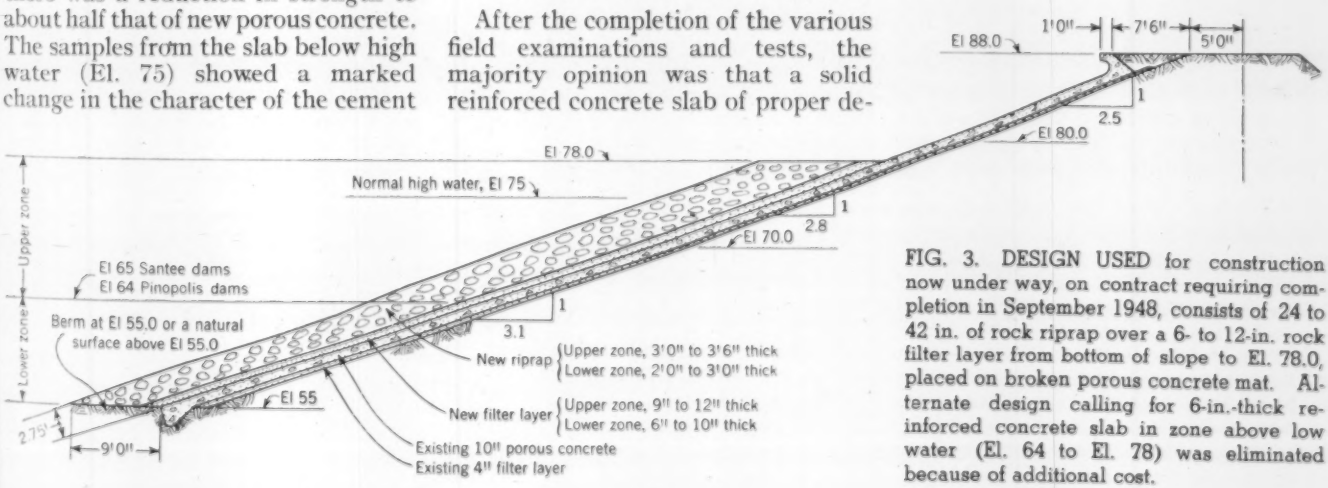


FIG. 3. DESIGN USED for construction now under way, on contract requiring completion in September 1948, consists of 24 to 42 in. of rock riprap over a 6- to 12-in. rock filter layer from bottom of slope to El. 78.0, placed on broken porous concrete mat. Alternate design calling for 6-in.-thick reinforced concrete slab in zone above low water (El. 64 to El. 78) was eliminated because of additional cost.

FRINGE OF TIMBER left standing in Santee reservoir is gradually falling. To prevent slope damage from this source, floatage is removed as it reaches shore.

was necessary from the upper limit of the wave belt (El. 78) to the crest.

4. Would rock riprap on a crushed rock or gravel filter layer stand without sliding on the slope of the porous concrete? If not, would break-up of the porous concrete prevent such sliding?

5. What should be the thickness and gradation of the filter layer materials and of the rock riprap?

The Board of Consulting Engineers, after reviewing the engineering data and the proposed alternative plans, decided that either of the following designs would be satisfactory:

1. A 6-in.-thick concrete slab extending from El. 64 to 78, reinforced with $^3/_4$-in. round bars 14 in. on centers both ways with additional bars across transverse construction joints.

2. Rock riprap 24 to 42 in. thick on a rock filter layer 6 to 12 in. thick, all to extend from El. 55 to 78, the porous concrete to be broken up from the bottom to El. 76.

The final design on which alternative bids were taken is shown in Fig. 3. This design included a combination of rock riprap in the zone below low water and reinforced concrete in the zone above low water.

When bids were opened on October 31, 1946, the lowest received were as follows:

For reinforced concrete pavement in upper zone only . .	$2,805,696
For reinforced concrete pavement in upper zone and rock riprap on rock filter layer in lower zone	$4,243,159
For rock riprap on rock filter layer in both zones	$3,822,800

A contract was let to the low bidder for the complete rock riprap job but as this bidder defaulted the contract was finally executed with the second low bidder, Grannis, Thompson & Street Co., and subsequently the contract was adjusted to provide for rock riprap in lieu of reinforced concrete pavement in the upper zone. The construction work on that contract is now under way on a schedule requiring completion in September 1948.

(*Continued on page 80*)

Sand Drains Save $750,000 in Marshy Section of New Jersey Freeway

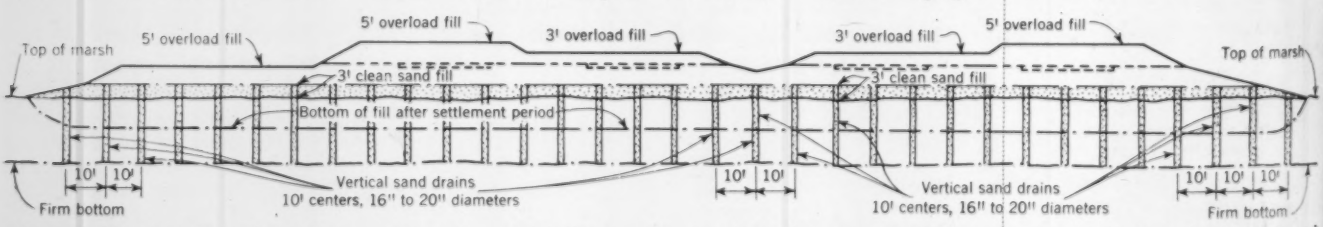
VERTICAL SAND DRAINS, in preference to excavation and fill, are being used for marshland consolidation on a 1.2-mile stretch of Route 100, New Jersey's first freeway. This method of consolidating the subgrade requires only 821,000 cu yd of borrow, 95,000 cu yd of channel excavation, 340,000 cu yd of sand blanket and 304,000 lin ft of vertical sand drains, as compared with 927,000 cu yd wet excavation, 1,268,000 cu yd borrow and 56,000 cu yd channel excavation required by the alternate method on which contractors were permitted to bid. The net saving to the state is estimated at $750,000.

The work consists of placing 18,000 units of sand drains, with minimum diameter of 18 in., spaced 10 ft apart in each direction and varying from 8 to 24 ft in depth. Although the contract does not specify the exact method of construction, the usual procedure calls for a 3-ft sand blanket through which a closed-end mandrel is driven into the underlying muck and silt to a specified depth. Sand is poured into the mandrel and the tube is withdrawn leaving the sand cylinder to act as a drain.

According to Charles M. Noble, M. ASCE, New Jersey State Highway Engineer, this method was also included in the bidding for construction of Route 3 in Secaucus, Hudson County, across the Secaucus Meadows adjacent to Penhorn Creek where sand drains as deep as 90 ft will be required to drain the underlying muck and silt.

The contract for grading Route 100 has been awarded to Construction Aggregates Corp., New York. O. J. Porter, M. ASCE, of New York and Sacramento, Calif., acted as consulting engineer for the New Jersey State Highway Department in preparation of the plans for the sand drain design.

The use of a seagoing dredge to remove salt marsh muck from another particularly difficult section of Route 100, at Woodbridge, N.J., is described by Commander Noble in the October 1947 issue of CIVIL ENGINEERING (pages 28 and 29).



MARSHY SUBGRADE under 1.2 miles of New Jersey's first freeway is consolidated by use of 18,000 vertical sand drains. In method used successfully in similar operations on West Coast, sand is poured into mandrel driven through 3-ft sand blanket and underlying muck, then tube is withdrawn leaving sand in place to act as a drain. Weight of fill compresses muck, forcing water into sand drains.

Ground-Assembled Forms Cast 312 Monolithic Exterior Columns

FORMS WEIGHING as much as 18 tons—constructed on the ground and lifted into place by crane—featured the erection in less than a year of 312 exterior concrete columns for five factory buildings at Willow Island, W.Va. These two- and three-story buildings are the major part of the plant being constructed by Turner Construction Co. for the Calco Chemical Division of the American Cyanamid Co. Other major buildings on the 1,100-acre site, 17 miles north of Parkersburg, are a power plant and a steel-frame warehouse.

In the construction sequence, footings for the columns were poured well in advance of the other operations. The column forms were erected and poured, usually four at a time, in sequence around the building. After the forms were stripped, grade beams were poured to the sill of the first-story window. Structural steel was then erected, followed by pouring of the spandrel beams.

Forms for Columns

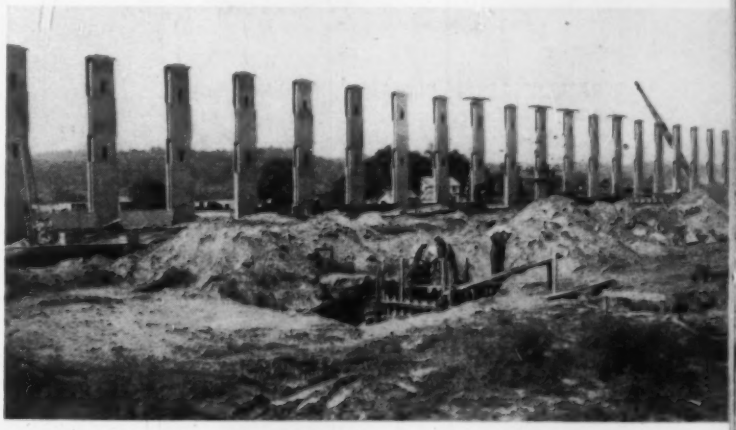
Column forms were built up of 3-in. tongue-and-groove lumber, fastened to channel iron girts and lined with $^1/_4$-in. masonite. Typical column forms were made in two vertical sections. Corner forms were constructed in three vertical sections to facilitate stripping. A steel plate with a 1-in.-dia jacking bolt was placed in each corner of the form for leveling and plumbing.

Completely assembled on the ground with all reinforcing steel in place and boxed out for spandrel beams, girder pockets and window frames, the forms were hoisted and set in place over the footing dowels by a Manitowoc speed crane with an 80-ft boom. They were then connected at the top in series of three and four by platforms from which the concrete was poured. Cable guy ropes attached to screw anchors held the forms in place.

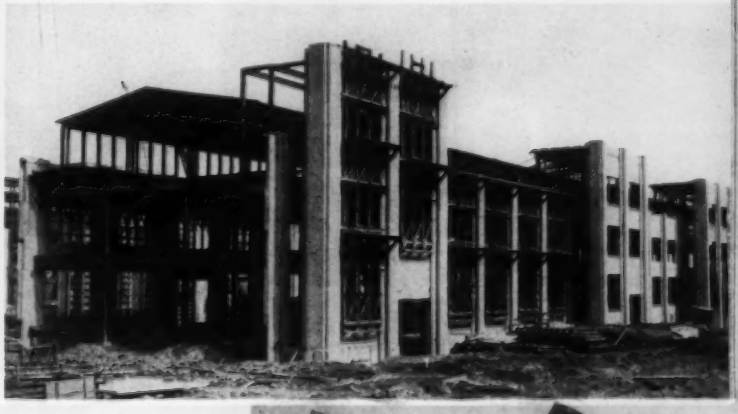
Concrete was poured into the forms in lifts of 12 to 14 ft through chutes of $7^3/_4$-in. steel tubing running down the outside of the form and into the column at points where there were beam pockets. Concrete was placed in four column forms in rotation, 2 cu yd at a time for typical columns and 3 cu yd for corner columns. Electrically operated vibrators were used externally on the

HEAVY FORMS 40 FT AND 50 FT HIGH (below) are assembled on ground prior to erection by crane for pouring reinforced concrete columns at site of Calco Chemical Division plant of American Cyanamid Co., Willow Island, W.Va. Reinforcement rods and stirrups are fixed in 3-in. tongue-and-groove timber forms connected to angle-iron corner posts and channel-iron girts with boxes set for girder and spandrel pockets. Intermediate and corner forms are made in two and three sections for easy stripping. Platforms connect forms at top for pouring columns in groups of three and four. Forms for pilasters and spandrels are Calco design with slight modification by Turner Construction Co.

MONOLITHIC REINFORCED CONCRETE columns (below), 6 ft 2 in. wide and 2 ft 2 in. deep, with beam and spandrel pockets, are ready for steel construction in one of five buildings of chemical plant. Grade beams for finished columns are set to first-floor window sills. At extreme right, forms assembled on ground are erected by crane over foundation dowels. In constructing 312 columns, 5,200 tons of structural and reinforcing steel were used and 36,000 cu yd of 3,000-lb concrete was poured.



STRIPPING OF COLUMN FORMS is followed by pouring of grade beams to sills of first-story windows. Structural steel for interior of manufacturing building is seen in view below. Spandrel forms made of steel I-beams and channel iron and 3-in. tongue-and-groove lumber are in place.



forms. During pouring operations careful checking by transit was required, as weather and sun affected alignment.

Approximately 15.5 cu yd of concrete was used in the typical two-story columns, 21 in the typical three-story, and 30 in the three-story corner columns. Four two-story columns were poured in about 6 hours; four three-story columns in 8 hours.

Serving as pilasters in the architectural design, the 6-ft 2-in. wide by 2-ft 2-in. deep columns are built on footings 6 ft below the first floor, with vertical reinforcement of four $1^1/_8$-in. square rods and two $^5/_8$-in.-dia round rods. In the three-story bays they rise to a height of 55 ft 1 in.; in the recessed spandrel bays the over-all height is 39 ft $9^5/_8$ in. with provisions for extra stories when required. The spandrel slabs, reinforced with $^1/_2$-in. temperature steel, are 1 ft thick and 6 ft deep.

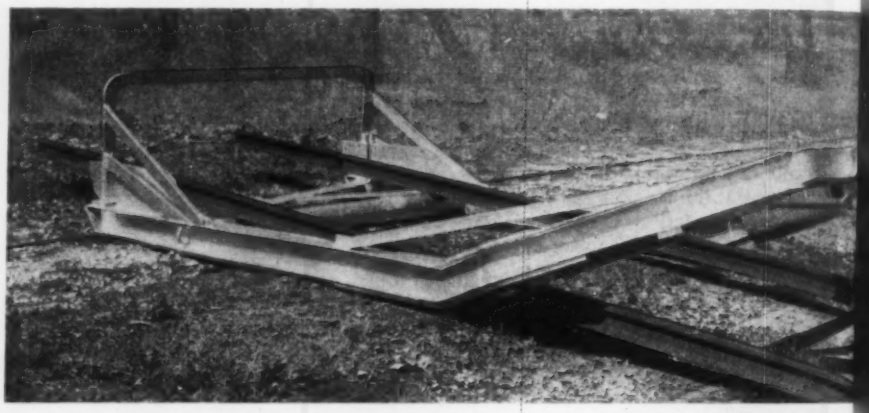
Construction of the five units will be completed this year. One unit is about ready for production and the other four will be in operation in the early part of 1948. The buildings, designed by the Calco Division, were erected by the Turner Construction Co. of New York.

Improvised Equipment Makes Rail Pulling Profitable

PULLING EMBEDDED RAILS by special equipment and repaving damaged streets is found to be more economical by the Memphis Street Railway Co. than resurfacing the entire width of the street leaving the rails in place. Removal of the embedded rails is expedited through use of a job-improvised machine consisting primarily of a truck-mounted lever arm and winch actuated by a power take-off on the drive shaft of the truck. The cost of removing the embedded rails, including cleaning and hauling, was $18.00 per ton. Profit in the sale of reclaimed rails at $38.00 per ton was applied to the cost of repairing the damaged streets.

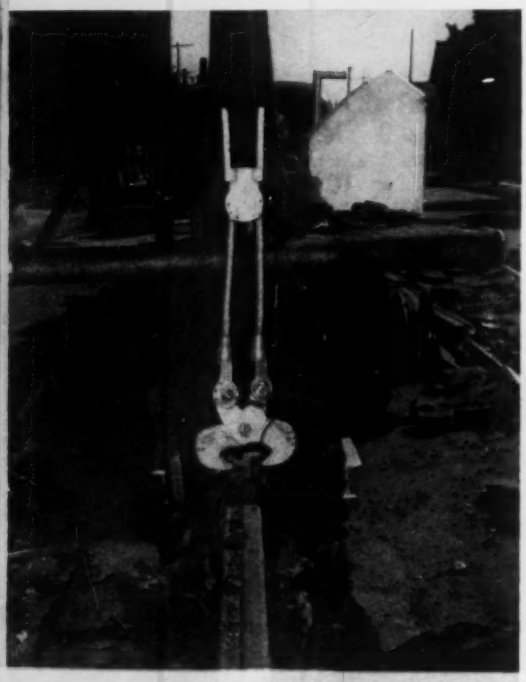
Four rail-removing trucks—owned by the Gorbett Welding Co., of Fort Worth, Tex., contractors on the job—removed as much as 1,500 ft of double track per day. This amount greatly exceeded the 800-ft minimum specified in the contract. The paving contractor, following the rail removal operation, cleaned out the resulting grooves and filled them with asphaltic concrete. After the filled grooves were compacted by means of a rubber-tired motor patrol weighing about 26,000 lb, a sheet asphalt paving was laid.

T-rail removal in open-track construction was accomplished through use of the "lizard" patented by A. D. McWhorter, chief engineer of the Memphis Street Railway Co. Contract prices for removing the rails were 23 cents per lin ft for removal of embedded rail and 11 cents per ft on open track construction.



T-RAIL-PULLING "LIZARD" (right) consisting of 6-in. roller on locomotive-drawn sled extracts 2 miles of single-track railway per hour. Two rails threaded over roller are pulled simultaneously as skids ride ties.

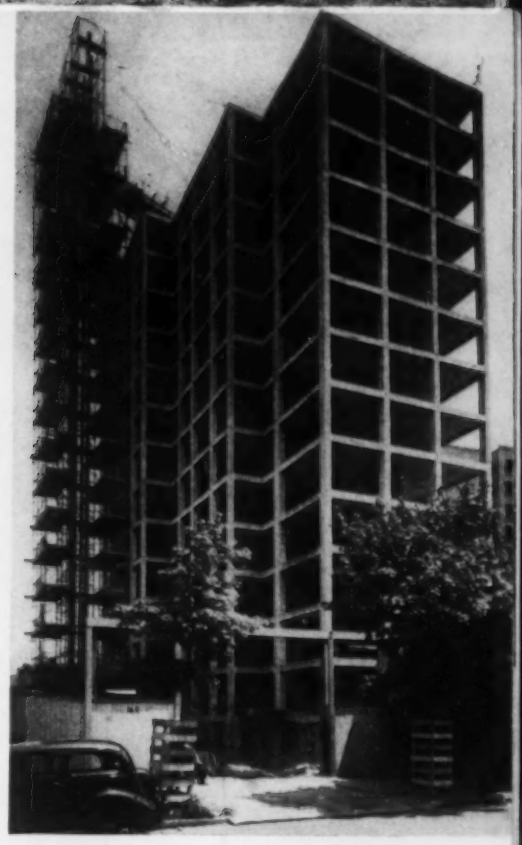
TRUCK-MOUNTED MECHANISM featuring winch-operated lever arm (below, right) and tongs (below, left) pulls 1,500 ft of embedded rail per day on contract calling for removal of 40 miles of grooved rail from Memphis, Tenn., streets. Force of pull is transferred to pavement on either side of rail through longitudinal skids attached to chassis of truck. Salvaged rails help pay for repaving damaged streets.



Good Building Codes—Properly Administered—Assure Public Safety

C. G. CAPPEL, M ASCE
W. Horace Williams Company,
New Orleans, La.

LIKE EVERYTHING ELSE in this fast-moving world, building codes must be kept abreast of the times. It takes the cooperation of owners as well as that of architects and engineers to accomplish the objectives sought by all building codes. Practical cooperation in this respect is seen throughout the country. The purpose of a building code, necessary changes because of developments in materials and methods, proper administration of a code, and recent revisions in the New Orleans Building Code are discussed herein.



WORKING UNDER BUILDING CODE and multiple-dwelling law which did not contemplate large multi-block developments, New York City Housing Authority has shown that fireproof housing in large-scale operations need cost no more than non-fireproof construction (May 1947 CIVIL ENGINEERING, page 32). Concrete structures such as those in Clinton Housing Project, Brooklyn, N.Y., have helped solve New York City's demand for low-cost rental housing. Photo courtesy Lone Star Cement.

RECENTLY a high federal housing authority expressed the opinion that a large percentage of cities have no building codes at all; that most places which do have them, do not enforce them; and that a large proportion of existing codes have been written for the benefit of private interests. All in all, his point was that the codes should be amplified and revised in order to reduce the cost of housing. This is just a case of making a "whipping boy" out of the codes—as bad or as good as they may be.

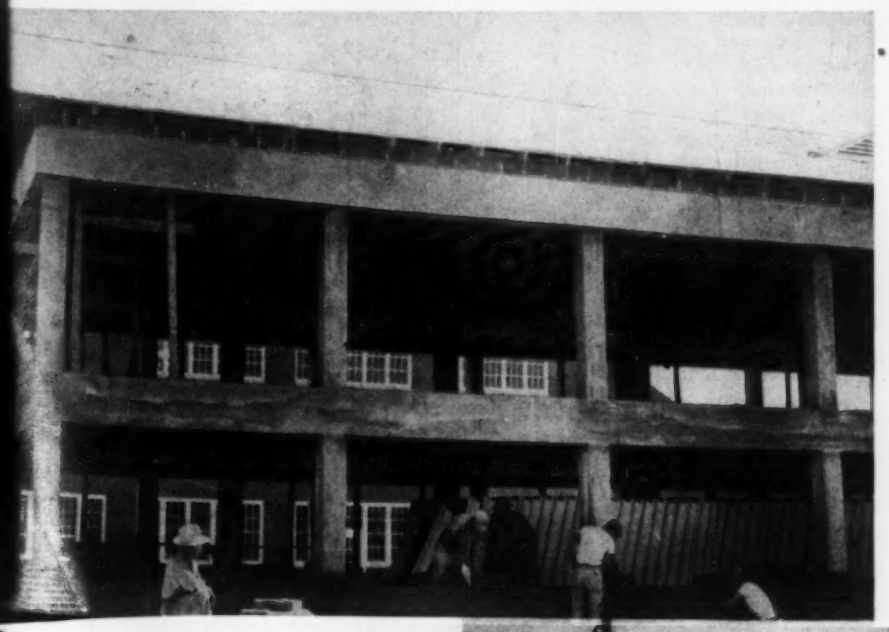
There are very few clauses in any code which materially affect the actual cost of residential construction, yet codes are the subject of almost universal criticism. We may think this is new, but it isn't; there has been almost the same amount of criticism ever since there have been building codes. Of course conditions sometimes intensify such criticism. A peculiar thing is that a very large majority of such criticisms come from people who are almost totally ignorant, not only of the purpose of codes, but of their content.

In recent months the writer has asked quite a number of building code critics if they knew what was in a building code, or if they knew its purpose. With very few exceptions their answers revealed that they knew absolutely nothing about codes except to use them in cat·h phrases so as to gain some form of self-advertisement or political advantage.

This does not mean that there is any building code which even approaches perfection, or that the majority of the codes in existence could not be materially improved, or that most of the abuses mentioned do not exist in some codes. Many cities and towns have no code whatever. There is always room for constructive criticism.

Code Provides Public Safety

The purpose of a building code is to provide for the safety of the public—physical as well as financial. A man cannot tell his neighbor what he is to do or how he is to live unless what the neighbor wishes to do causes inconvenience or hazard to those around him. That principle is the basis of all building codes. The best interest of the public is not always well defined, so in this, as in almost everything, there must be some compromise between the ideal and the practi-



PUBLIC SAFETY IS BASIC CONSIDERATION in preparing modern building codes or revising old ones to keep them abreast of times. Students at Howard Payne College, Brownwood, Tex., meet housing situation by building comfortable, fire-safe dormitories with student labor, under direction of competent building superintendent. Photo courtesy Lone Star Cement.

CODE REGULATIONS lag behind development of new materials and methods, but many agencies are now working toward solution to problem. Prefabricated shop building of Butler Manufacturing Co., Kansas City, Mo., is example of structural electric arc welding applied to obtain rigid construction and clean interior. Photo courtesy Lincoln Electric Co., Cleveland, Ohio.

cal. Most present-day codes provide for the safety of the public at least in some measure.

It might seem as though building codes were the result of present-day concentration of population and modern construction methods, but this is not the case. History tells us that as long ago as 2,000 B.C. King Hammurabi of Babylon issued edicts that were the equivalent of our present-day building codes. He was not specific as to types of construction or occupancy, but he was most definite as to efficiency of design, and the penalties he provided were severe, up to and including the death penalty.

Roman emperors apparently were the first to combine considerations of strength, fire-resistance and sanitation in their building code regulations. London had a building code of sorts as early as the year 1189. New York apparently started regulation of building construction in 1648.

The building of our national capital was planned and regulated not only in regard to safety and sanitation, but also as to appearance. This is a very rare provision. Present-day codes omit the consideration of appearance and limit themselves to provisions for safety.

Materials and Methods Change Codes

Until about 100 years ago, there were few changes in materials of construction, hence little was needed in the way of regulation, but in the last 100 years developments in construction materials and construction methods have necessitated the development of appropriate regulations. Developments in the building field have been gradual and progressive, being dictated by changing needs and inventions. Naturally, code regulations lag behind the development of new materials and methods, so even the nineteenth-century building codes were subjected to the same criticisms we hear today.

The ASCE, the American Society for Testing Materials, the Underwriters Laboratory and the National Bureau of Standards have been major agencies in the development of sound, basic regulatory provisions. Today many organizations are bending their efforts toward the improvement of building codes and the solution of the problem of keeping them abreast of the times.

Recent holocausts and the housing shortage have pointed up the interest in codes. Paradoxically, these two factors are apparently in conflict. The first one mentioned has led to demands for stricter regulations and the second to demands for relaxation of regulations. Actually, there is not as much conflict as would be expected. Proper safety can be provided with very little added expense, and the average code has very little to do with the cost of housing where the shortage is most acute.

If a code is to be workable, usable and effective, it must be kept up to date. New developments in construction materials and methods are appearing almost daily. Of course they cannot be accepted until proved, but the proof follows closely in many cases and it is therefore necessary for building codes to have flexibility so that they can be easily adapted to new developments. The best way to do this is to establish a Board of Appeals whose authority transcends that of the enforcement authorities. The duty of such a board is not only to interpret the code, but also to incorporate changes and improvements in it in proper legal fashion so as to keep it abreast of the times.

A good building code covers the question of safety from several angles: structural, fire, occupancy, sanitation, and special and local conditions. It will be noted that this is almost a definition of engineering. For purposes of clarity and to avoid needless repetition, codes are usually divided into general classifications pertaining to:

Administration	Occupancy and Use
Location	Electrical
Structural Features	Mechanical

PROGRAM THAT CALLS FOR COOPERATION of structural steel interests, engineers and city officials in New York City envisages use of higher stresses for structural steel, use of cold riveted and welded steel parts and introduction of many new and safe materials to save time and reduce costs. New, light-weight steel stairs in photo are installed with steel framework and put into immediate service in large-scale housing project of Metropolitan Life Insurance Co., New York, N.Y.

Briefly, the table of contents of a building code is about as follows:

- Definitions
- Administration
- Safety and Construction
- Board of Standards and Appeals
- Use and Occupancy
- Fire Limits and Requirements
- Types of Construction
- Quality and Design of Materials of Construction
- Fire-Resistive Standards
- Street Obstructions
- Elevators and Mechanical Devices
- Mechanical Equipment, Gas Regulations
- Electrical Installations and Equipment
- Sewer and Water Regulations
- Rat-Proofing
- Boiler Inspection
- Smoke Abatement, and Control of Any and All Activities Involving Public Health and Safety

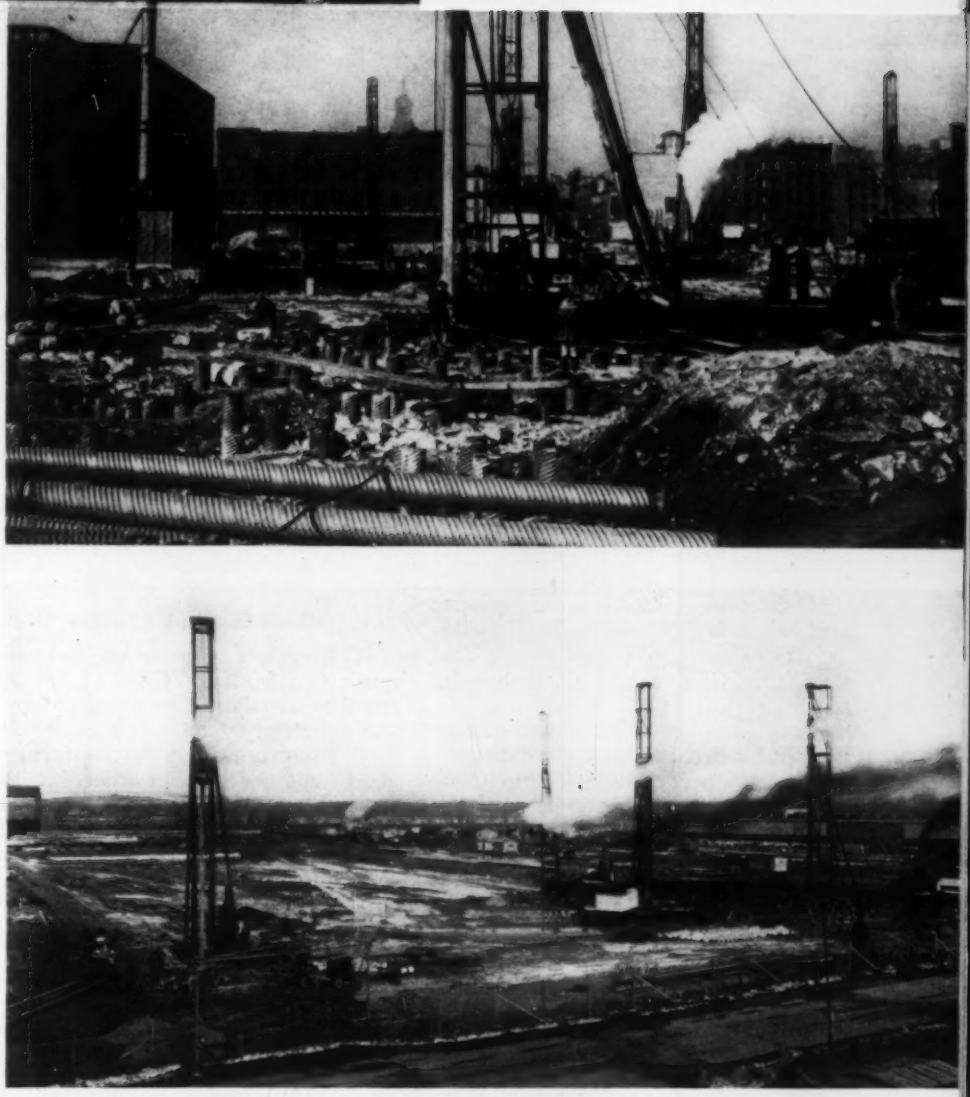
Because of the complexity of our legal setup, it is advisable to divide the code into several divisions, with a separate ordinance for each division. In this way if the legality of one ordinance is attacked, the whole code is not made inactive.

No code, however good, is of much value unless it is properly enforced. The usual tendency of well-intentioned citizens is to obey the rules laid down by proper authority. However, as soon as it becomes known that a law or regulation is not enforced, it is flagrantly violated and quickly comes into contempt. The actual performance of enforcement is 50 percent of the problem, in the writer's opinion, and the proper form of a good code is the other 50 percent.

Should Be Properly Administered

If safety is the prime purpose of a code, it follows that engineering is the basis of all codes. Moreover, any organization that has to do with construction should have a chief engineer, and this chief engineer should be the executive head of all the concern's activities which relate to engineering from the standpoint of either design or construction. It follows that a city engineer is properly the chief engineer of a municipal corporation. He is the proper executive head for the administration of the building code. On all sides it is stated that the city engineer has too much to do looking after the city, but an efficient executive is not limited in the scope of the activities he can direct.

There appears to be a definite trend toward the establishment of a new bureau or department to administer the building code. It seems to the writer that this is largely an admission of inefficiency and defeat. In many instances it is found that a new authority created for this purpose is non-technical at the top. The result is the confusion which always results when professional activities are directed by non-professional executives. The writer states, therefore, without equivocation, that the city engineer is the man who should be in active charge of the administration of all building codes.



SETTING UP OF NATIONAL CODE is complicated procedure and may take some time to complete. In writing any code, local conditions with reference to foundations, wind, earthquake resistance, insects and climate must be considered. Units in New York City's Stuyvesant Town housing project (top photo) are supported on 40,000 button-bottom piles aggregating $1^3/_4$ million lin ft. Four pile drivers (bottom photo) place cased pedestal and 12-in., 53-lb H-piles for foundation of General Electric Co. building, Schenectady, N.Y. Photo courtesy Western Concrete Pile Corp., New York, N.Y.

New Orleans Building Code

The New Orleans Building Code was not really in bad form before its recent revision in July 1947. Back in 1922 the writer was a member of the committee which drew up the original code. Public hearings were held and the work was interminable. In 1929 a not-too-bad code was published. It was revised in 1942, but the actual effectiveness of the revision was somewhat nullified by the fact that the committee had no control over the finished product. As the code stood after revision in 1942, it was as good as the average. One of its main faults, improper indexing, was corrected in the 1947 revision, and other desired improvements have been made, such as inclusion of regulations in regard to solid-front buildings, liquefied petroleum gas, etc.

One of the main changes made in the 1947 revision was in regard to pile foundations. All of the dynamic formulas for determining the carrying capacity of piles were discarded. Provision is made for actual loading of test piles, and formulas are provided for reductions due to inefficiency of grouping. The specific provision is made that no piles shall be driven closer together than 3 ft, or closer together than 5 percent of their over-all penetration. This provision was inserted as a result of experience in New Orleans and vicinity. It is definitely known that if friction piles are spaced so close together that the

cone of influence of one overlaps the cone of influence of the other, then the soil is overloaded at the points of overlap, causing subsidence and sometimes failure.

In preparing a building code, it is not deemed proper, and probably it is not legal, to refer to current issues of engineering specifications or the like, but it is considered proper, and it is very desirable to provide that compliance, for instance, with the regulations of the American Institute of Steel Construction, the American Concrete Institute, the Forest Production Laboratories and the like, should be considered as compliance with the code. This is a very proper and necessary provision in all building codes as it gives a latitude and flexibility that would otherwise be lacking.

A number of good building codes are now published in the United States. Among them are the Uniform Code of the Pacific Coast, the code of the Board of Fire Underwriters, the Southern code, and others. Efforts are being made to set up a Uniform National Code, and some progress is being made along this line. There is encouragement in the operation of the National Electric Code and the National Elevator Code. However, local conditions do not govern these two operations nearly as much as they do other parts of building construction. Therefore the job of setting up a National Building Code is complicated and may take some time. No matter what the final code turns out to be, local conditions will have to be provided for, particularly with reference to foundations, wind, earthquake resistance, insects and climatic conditions.

Good Engineering Practice

It would of course be best, and quite simple, if a "Code of Intent" could be written. One sentence would serve—merely the statement that "All construction is to conform to good engineering practice." But we are not nearly that far advanced. We may never advance that far, so we have to depend on a code of specifications in which details are set forth in as clear and concise a manner as possible.

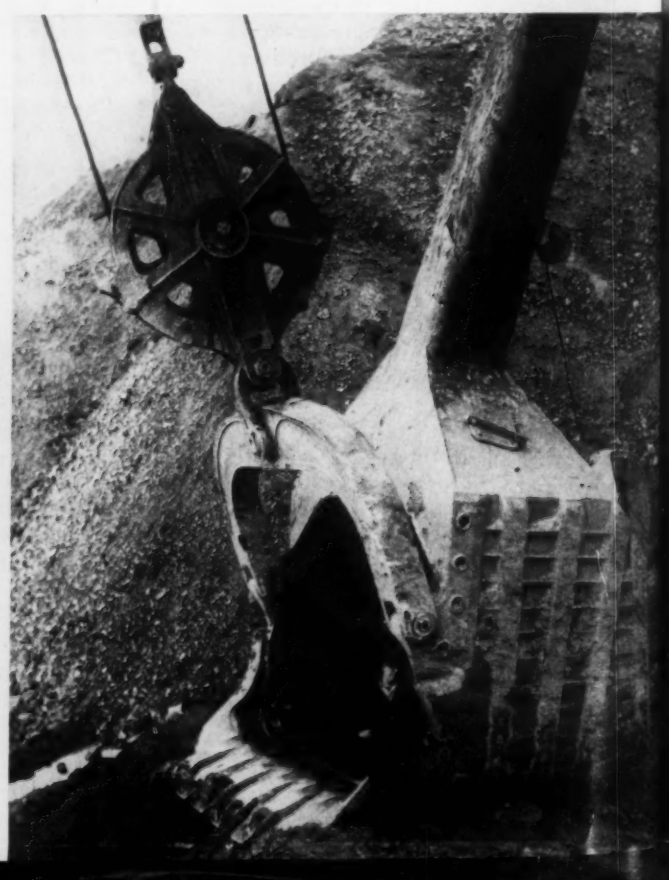
The engineering profession has not been active enough in the preparation and activation of building codes. In many instances this work is left to lawyers, civic-minded non-professional men, politicians and the like, to say nothing of our confreres, the architects, who are all vitally interested in building codes. The architects' interest does not lie strictly in the architectural line as building codes do not regulate architecture. They only regulate the engineering incident to architecture.

On the committee for revising the New Orleans Building Code there were two architects, five engineers, one contractor, and a representative of the Fire Prevention Board.

The writer's message—if it can be called a "message"—or his plea, if it can be called a "plea"—is that the engineer take a more active interest in the safety of his community, as protected by the institution and enforcement of an efficient building code.

Dipper Handles 40 Cu Yd at 120-Ft Range

WORLD'S LARGEST DIPPER is capable of handling 40-cu yd load at maximum dumping radius of 120 ft or maximum dumping height of 80 ft. Although dipper capacity is 5 cu yd greater than previous model developed by Marion Power Shovel Co., weight of dipper, bail, handle and material load is 4 percent less. Design changes include lengthening of crowding handle 2 ft, stiff-leg 3 ft and boom 15 ft. Substitution of low-alloy structural steel for conventional mild steel in these parts accounts for 17.5 percent decrease in weight of front end. Stability adjustment, because of longer range, consists of adding small amount of ballast to shift center of gravity about 1 ft toward center of rotation. Marion "Long Boy" with "Big Bertha" dipper (below, left) is used for stripping job by Sunlight Coal Co., Booneville, Ind. Size of 40-yd dipper (below, right) can be judged by comparison with size of man in photo.



Deep Caisson Piers Support New Memphis Highway Bridge

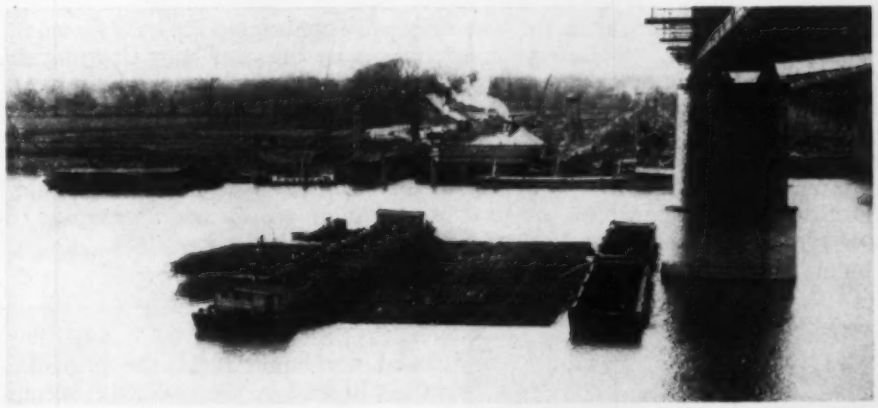
SEVEN GRANITE-FACED reinforced concrete piers for the four-lane highway bridge now under construction over the Mississippi River at Memphis, Tenn., are now ready for erection of the multiple cantilever superstructure. The 3,695-ft-long main bridge structure, designed by Modjeski & Masters, Harrisburg, Pa., for the states of Arkansas and Tennessee, is located 200 ft downstream from the Frisco Railroad Bridge (opened in 1893), and 400 ft downstream from the Harahan Bridge serving both railway and highway traffic (opened in 1916). A clearance of 109.4 ft above mean low water is provided by the river piers which are over 225 ft high from bottom of caissons to capstones.

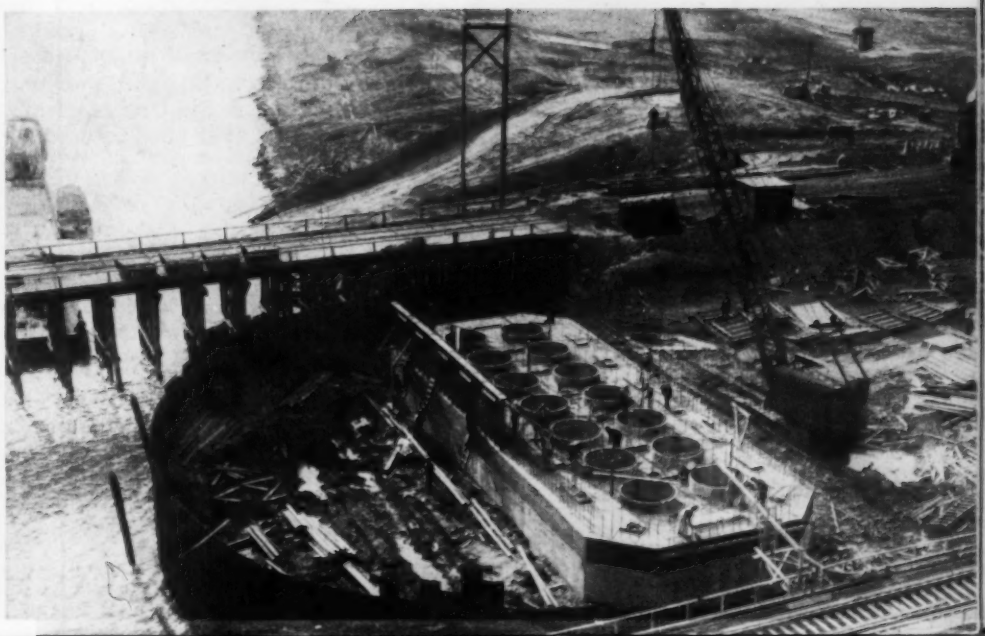
At the Memphis end of the bridge the four main piers were founded in pneumatic caissons. The three piers on the Arkansas bank were founded by open dredging. The deepest of the pneumatic caissons rests on hard blue clay at a depth of 100 ft below low-water elevation. Built on the Wolf River at Memphis, the 40×100 by 20- to 30-ft-high steel caissons were launched on regular shipways, floated to position and tied by cable

(*Continued on page 80*)

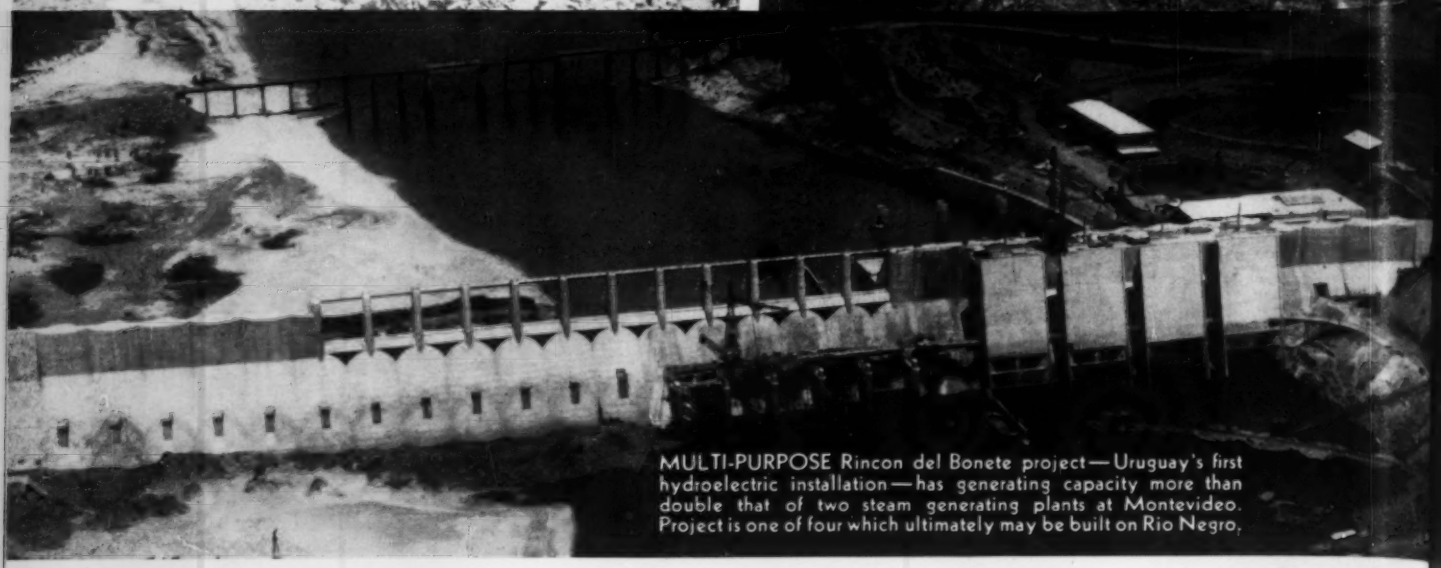
SEVEN REINFORCED CONCRETE PIERS (above) rising 225 ft above bottoms of caissons await erection of seven-span, 3,695-ft cantilever and through truss superstructure for four-lane highway bridge across Mississippi River at Memphis, Tenn. Looking from Memphis side, first four piers between river banks were founded in pneumatic caissons, remaining three by open dredging. To right of new construction are Frisco railroad bridge and Harahan railroad and highway bridge. Design and supervision of construction is by Modjeski & Masters, consulting engineers, Harrisburg, Pa. Merritt-Chapman & Scott, New York, are contractors for pier construction.

WILLOW MATTRESSES, 250×350 ft, woven on specially built barges (below), are sunk with riprap to prepare site for sinking of two deep-water caissons. Mats are anchored by 1½-in. cables to 20-ton concrete blocks 1,000 ft upstream. Steel caissons floated into position are brought to rest on mattresses by addition of about 2,000 tons of concrete.





OPEN DREDGING IS USED in initial sinking of main river pier (right) on Arkansas side of river before sealing off for completion of operation by pneumatic methods. Fourteen wells, 8 ft in diameter, provide shafts for excavating sand and clay. Crane in photo is placing forms for new lift of concrete. Sinking operation is protected by 150-ft-dia sheet steel cofferdam.



MULTI-PURPOSE Rincon del Bonete project—Uruguay's first hydroelectric installation—has generating capacity more than double that of two steam generating plants at Montevideo. Project is one of four which ultimately may be built on Rio Negro.

Uruguay's Rincon del Bonete Project Supplies Country's First Hydro Power

LUIS GIORGI, M. ASCE

Director General, Comision Tecnica y Financiera de las Obras Hidroelectricas del Rio Negro, Montevideo, Uruguay

FACED WITH THE PROBLEM of increasing its annual per capita electrical production from the low figure of 150 kwhr, Uruguay is rushing to completion its first hydroplant, Rincon del Bonete on Rio Negro, 150 miles from Montevideo. Work on the project, being built by an official agency of the Uruguayan Government, was originally contracted for by a German syndicate in 1937. Following interruption by the war, the Uruguayan Government made arrangements with the State Department, the Eximbank and American manufacturers to get the necessary priorities and allocations needed at that time (1941–1943) to obtain funds for materials and American services, and to contract for the manufacture of machines, equipment and materials to complete the project. The finished project, the first two units of which are now in operation, will provide a surplus of low-cost hydro energy for industrial development until about 1954.

BECAUSE URUGUAY has neither solid nor liquid fuels, the principal fuels burned in the two main steam stations in Montevideo since the outset of the last war have been corn, sunflower seed and other grains. These fuels, plus small quantities of coal available from England, were the only ones obtainable in Uruguay from the beginning of 1942 until the middle of 1945. The increased cost of fuel during the war period, and the loss of efficiency due to continued use of inadequate fuels, made the cost of operating the steam plants $25,000,000 more than in normal times. This fact alone justified the construction of the first hydroplant in the country.

At present, Uruguay has in operation the first two units of a hydroelectric project located on the Rio Negro at Rincon del Bonete, 150 miles from Montevideo. When this project is completed, it will more than double the actual capacity of the two steam generating plants at Montevideo. The Rincon del Bonete Project will have four Kaplan turbines of 45,000 hp each (a total of 180,000 hp) at 125 rpm, driving electric generators of 32,000 kva, each of 13,800 volts, 50 cycles (128,000 kva total); two overhead transmission lines each 150 miles long; one main transformer station to step up the voltage at Rincon del Bonete; two

FIG. 1. RIO NEGRO (right) flows full breadth of country from Brazilian border southwesterly into Rio Uruguay on Argentina border. Location is ideal for supplying hydro power to entire country.

CONCRETE CORE of earth dam (left) forming east 305 ft of 3,846-ft structure is seen in foreground. Cofferdam on left bank of river is still seen in view showing late stages of construction.

transformer substations and two other 31.5-kv substations at Montevideo; and more than 45 miles of underground 31.5-kv cables interconnecting these substations in Montevideo. One of the transformer substations will link the steam plants with the hydro project. All the power generated at Rincon del Bonete will be sent, for the time being, to the city of Montevideo whence it will be fed into the distribution network of the city and to the transmission lines spreading out from it and supplying the many small towns in the area, some of them 80 miles distant from the capital.

ROUND-HEAD BUTTRESS TYPE DAM with spread footings is used for highest section where foundation rock is of poorest quality. Downstream view of dam shows powerhouse at left, spillway section in center and four intakes at right. Construction bridge is in foreground.

Project Started by Germans

Construction of the Rincon del Bonete Project was started in 1937 by a German syndicate which built most of the dam and the foundations of the powerhouse; manufactured, supplied and installed the penstocks, trashracks, draft tubes, and speed rings for all four units and the generator supporting ring for three units; and supplied the intake roller gates and draft-tube stop logs. No work on the powerhouse superstructure, except the control house, was completed by the syndicate. The rest of the turbine parts, generators, and other electro-mechanical equipment were partially completed in Germany, but delivery was not possible.

In May 1942, the Uruguayan Government canceled the contract with Germany and made an agreement with the U.S. State Department, through which the American Government authorized American manufacturers to build equipment and supply materials to finish the Rincon del Bonete Project. At the same time, the Export-Import Bank of Washington granted a loan of $12,000,000 to pay for equipment and materials.

The American manufacturers started work on the project in the beginning of 1943. The main manufacturers engaged in this work are S. Morgan Smith, York, Pa., for the hydro turbines; International General Electric, New York, N.Y., for the electric generators; Westinghouse Electric International Co., New York, for the transformers, circuit breakers, switchboards and miscellaneous electrical equipment; General Cable Corp., for the overhead transmission line, conductors and underground cables; U.S. Steel Corp., New York, for the transmission-line towers and several steel structures; Delta-Star Electric, Chicago, for the high-tension substation structures; Dravo Corp., Pittsburgh, Pa., for the spillway gates; Harnischfeger Corp. for the Rincon del Bonete powerhouse cranes; and a few other firms supplying minor equipment. The Harza Engineering Co., Chicago, was appointed to act as consulting engineers for the job. The project is being built by Rione (Comisión Técnica y Financiera de las Obras Hidroeléctricas del Rio Negro, Uruguay), an official agency of the Uruguayan Government.

In 1947 the consumption of energy in the interconnected system within a radius of 80 miles from Montevideo, which will be partially supplied by the Rincon del Bonete Project, will be about 400,000,000 kwhr per year. 320,000,000 kwhr will be supplied by the Rincon del Bonete hydro plant and the rest by the two steam plants, which have 90,000-kw installed capacity. It is expected that consumption will increase by 1954 to about 537,000,000 kwhr, 89 percent of which will be produced by the hydroplant, leaving the other 11 percent to be produced by the steam plants.

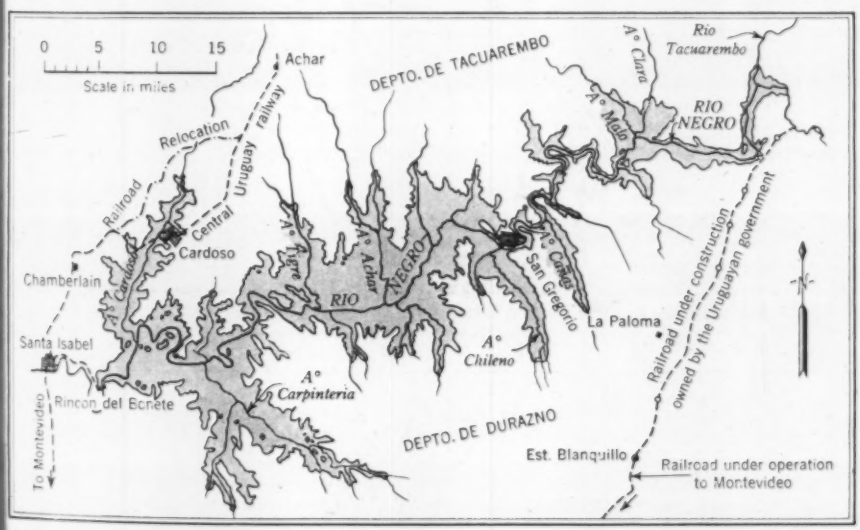


FIG. 2. **AVERAGE ANNUAL RAINFALL** on Rio Negro is high, but long severe droughts make adequate storage essential. Rincon del Bonete project provides 100-mile-long navigable lake above dam and supplies water for year-round navigation on 245 miles of river below dam.

River Flow Varies Widely

The Rio Negro flows entirely across Uruguay from the Brazilian border on the northeast, southwesterly into the River Uruguay, which forms the boundary between Uruguay and Argentina on the southwest. The total length of the Rio Negro is about 500 miles and the total drainage area is 26,400 sq miles. The drainage area at Rincon del Bonete is 14,650 sq miles. The average annual rainfall on the watershed is 45.4 in. a year, but there are very long and periodically severe droughts. The maximum registered flow is about 196,000 cfs and the minimum is only 715 cfs. For this reason, storage of water for the project at Rincon del Bonete is

POWERHOUSE INTAKE, spillway and bulkhead portion of dam with lengths of 289 ft, 533 ft and 405 ft respectively, are of round-head buttress design. Remaining 2,308 ft of structure at both ends of dam is of gravity design. Modern village (foreground) provides comfortable living quarters for employees and workers.

very important. The minimum temperature in the watershed area is never below 32 deg F, and the maximum never exceeds 96 deg F. The reservoir has a normal level of only 263 ft above sea level and its extent at that level is 442 sq miles, the normal storage volume being 7.5 million acre-ft. The minimum reservoir operating level will be 235 ft and the maximum 273 ft, a variation of 38 ft.

Other Hydro Projects Planned

From the map of Uruguay (Figs. 1 and 2) it can be seen that the Rio Negro is very well situated to supply the entire country with electricity, because it divides it into two almost equal parts. The Rincon del Bonete Project, which is approximately in the center of the country, is one of four possible hydro projects which may ultimately be built on the river. Proceeding downstream, these projects are:

Name	Distance from River Mouth (Miles)	Approx. Installation, Kw
Rincon del Bonete	245	128,000
Baigorria	192	84,000
Paso del Puerto	128	139,000
Yapeyú	84	107,000

There are two other possibilities in the upstream direction, one the Rio Negro and the other on its main tributary, the Rio Tacuarembó. At present no study of those two possibilities is in prospect. The other four projects, including the Rincon del Bonete, will be able to produce 1,500 million kwhr annually, the expected demand in Uruguay as of 1960.

The present project, Rincon del Bonete, creates a very large storage reservoir, which will be economically utilized when the other three projects are built. The project is multipurpose; although it was basically designed for power, the dam provides a navigable lake 100 miles long and permits navigation along the 245 miles of the river between the dam and the mouth of the river at 7-ft draft for 300 days a year. Previously the river could be used for navigation only in the winter, and even then no more than 50 days a year.

Boat Transfer Takes Place of Lock

Since there is no lock on the dam, Rione has built a boat transfer at the throat of the bend made by the river, so that boats can pass from the reservoir to the downstream side of the dam, or vice versa. The name of the project, Rincon del Bonete, is derived from this bend (see Fig. 3). By means of a special railroad car and boat hoists, the transfer takes boats to a turntable at the top of the hill. Here, the direction of the boat is reversed before it is moved down to the river on the other side. Thus the stern is the last part of the boat to leave the water on the reservoir side, and the first part to enter the river below the dam on the other side of the hill. The length of the boat transfer track is about 2,600 ft, and the level of the top of the hill is 306 ft, which compares with the 263-ft normal level of the reservoir.

Boats up to 110 gross tons in dead weight can be handled by the boat transfer. The reason for building a transfer instead of a lock is that the latter would cost about $1^1/_2$ million dollars, and the boat transfer cost only $^1/_4$ million. It is considered that the boat transfer will be satisfactory until the development of navigation justifies the considerably larger expenditure for a lock. In order to facilitate lock construction at some future date, steel piles were left embedded in the dam to permit the building of a cofferdam, which will be necessary before part of the dam can be blown out to make room for the lock.

The maximum flow considered in the project is about 325,000 cfs; the maximum spillway capacity under that flow is 160,000 cfs; and the rise of the reservoir above normal level at this flood with this spillway capacity will be 9.2 ft. Assuming that the reservoir is at normal level (263 ft) when the flood starts, the maximum assumed flood peak will be reduced to 49.4 percent. Thus the Rincon del Bonete installation may also be considered a flood-control project.

Spread Footings in River Bed

The dam has a length of 3,846 ft and is about 137.4 ft high. It is completely constructed of concrete except for 305 ft of earth dam with a concrete core at the east end. The foundation rock is basaltic lava with a varying degree of soundness. For the highest section in the river bed, where the foundation loading would otherwise be greatest, and where the rock is of poorest quality, a round

URUGUAY, the smallest country in South America, has a surface area of about 72,000 sq miles and a population of almost three million. Besides Montevideo, the capital, with a population of 800,000, the country has more than 18 cities with populations ranging between 10,000 and 45,000. Its many industrial plants, such as meat and vegetable packing houses, weaving and textile factories, etc., industrialize the products from the two main sources of livelihood—cattle raising and agriculture. Uruguay also has thriving cement plants and rubber tire and tube factories, which have increased its industrial capacity considerably within the last 15 years.

FIG. 3. BOAT TRANSFER 2,600 ft overland, from reservoir to point on river below dam, is substitute for lock to be built when navigation warrants 1½-million-dollar expenditure.

buttress-head type dam with spread footings, originally designed by Noetzli, was adopted to minimize the unit foundation loads.

The buttresses, 6.6 ft thick, spread to 41 ft in order to form the round heads. This type of construction is used for the powerhouse intake, the spillway and a bulkhead portion in lengths of 289 ft, 533 ft, and 405 ft, respectively. The remainder of the dam, adding up to 2,308 ft at both ends of the aforementioned sections, with the exception of short transitions, is of gravity design.

When the first few buttress heads were poured, superficial shrinkage cracks developed, which tended to throw doubt on the theory of this design. Thereafter, to avoid further cracks, cooling coils were placed in the center of each buttress, causing the center to cool as quickly as the exterior. Furthermore special cement was used to cut down the heat generated during setting. All the cement, including the special kind, was manufactured in Uruguay.

A copper U-strip was used to seal the 1-in. space left between buttress heads. This space was later dry-calked with cement mortar to prevent the buttresses from spreading as the result of water pressure in the shrinkage cracks. This remedy is believed to be completely effective.

Foundation Thoroughly Grouted

Thorough grouting, which was of prime importance because of the imperfect quality of the foundation, was done in two lines of holes spaced four meters, or about 13 ft, apart in each line and staggered with reference to the holes in the adjacent line, so that each hole was about 8 ft from every other hole.

Grouting was done in steps each 13 ft in depth. Holes, about 3 in. in diameter, were drilled with calyx shot drills to a depth of 13 ft below the concrete cutoff and grouted. As soon as the cement had hardened sufficiently, the holes were redrilled and regrouted to final refusal, which sometimes required several cycles. Then the holes were extended an additional 13 ft in depth and again grouted, this time with a rubber packer to limit the grout to the newly drilled extension of the hole, repeating the process until the total of 80 ft below the foundation was reached.

By omitting the wings of the buttress heads at the bottom, five openings for passing the river during construction were left under the spillway portion of the dam. The buttresses were also extended and provided with stop-log grooves in the upstream direction to serve as closing piers.

Because of seasonal river stages and the necessity of relocating about 16 miles of railroad, closing could not be safely started until about December 1944. Finally, in December, blocks of concrete were poured behind the protection of stop-logs into the five wedge-shaped openings (approximately 25 ft high by 35 ft wide). The last sections were poured while the river flowed through one of the three turbine penstocks (with its scroll case and draft tube) that was not in use at the time.

German and U.S. Methods Differ

Complete lining of the draft tube with steel plate from the turbine around the elbow, and horizontally to the tail gates, is the only noticeable characteristic which differentiates the German embedded parts from similar United States manufactured equipment. The standard United States practice is to line only about two or three draft-tube diameters in the straight vertical cone below the turbines.

Unlike the usual short United States pit liners, the German pit liners, made of welded steel, are extended up to the generator floor level and adapted as bases for the generator. Sometimes this is done in the United States, especially for high heads. At Rincon del Bonete there is an initial effective head of about 92 ft. Therefore the available diameter of base, to which the generators of United States manufacture had to be fitted, is greater than for standard United States design. The runaway speed problem, thus accentuated, was solved by adopting a slower and more efficient operating speed of unit, at very little increase in price. The German design speed of 136.4 rpm was decreased to 125. This slower speed had previously been cited by the German report on the project as preferable, but had been rejected because of increased generator cost.

A substation mounted on a compact tailrace platform on nearby river piers, permits energy to be stepped up to 161,000 v. From it electrical energy is transmitted over a distance of approximately 150 miles to Montevideo through hollow-type HH copper conductor on two single-circuit steel tower lines 300 meters (912 ft)

FIRST GENERATING UNIT of project is put in service during ceremony attended by workers and their families. Generator rotor and shaft for second unit are seen in assembling room of powerhouse in foreground.

FINISHED RINCON DEL BONETE DAM—first two generating units of which are now in operation—is big factor in plans for industrialization of Uruguay. Spillway of dam is pictured discharging 79,000 cfs. Powerhouse is seen in left background.

apart, except for 12 miles of double-circuit tower line in the suburbs of Montevideo where right-of-way is expensive. As only copper was available owing to wartime restrictions on aluminum, type HH copper conductor of 296,000 cir mils was adopted for this project. Because timber for 65-ft poles is unobtainable in South America and shipping space from the United States is at a premium, steel towers were authorized.

The voltage of the overhead lines, which terminate at the northern substation in Montevideo, is there stepped down to 31.5 kv and distributed to load centers in Montevideo over a 31.5-kv underground network. The principal part of the network is like a square with a diagonal connecting the north substation at one corner directly to the steam-plant substation at the south corner. The other two corners represent substations "G" and "J," one on the east and the other on the west side of the city. These two substations are now served by the steam plant through two sides of the square. Other sides of the square serve to feed these substations with the hydro power from the north substation. From the north, "J," "G," and steam substations, the 31.5/6.3-kv network substations are supplied.

Air-blast circuit breakers on the 31.5-kv system were adopted to conform with the prevailing tendency of avoiding the necessity for importing oil. Indoor location was decided on for these breakers because the outdoor type was still in the experimental stage in the United States at that time. Outdoor space was allowed for the 161-kv breakers in both the hydro plant and north substations. These breakers will be installed early in 1948.

Saving in Critical Materials

By employing forced-oil-cooled transformers at the hydroelectric station to cut down size and weight of

(*Continued on page 80*)

Underground Exhaust Duct Eliminates Inconveniences of Overhead System

AN EFFECTIVE MEANS for removing wood dust and shavings presents a major problem in the design of a woodworking plant. Conventional overhead systems of metal ducts are hampered by difficulties and dangers in cleaning, and are unsightly and space wasting. Networks of supply ducts and many branches extending over the working area, with drop-pipes to the machines, cause further complications by interfering seriously with proper lighting and ventilation.

To overcome such difficulties and inconveniences a new underground system, using standard-size vitrified clay pipes up to 21 in. in diameter for main ducts, was installed recently in a 40,000-sq-ft extension of a large woodworking plant located in Akron, Ohio.

Clay pipe was chosen for the underground duct because of its resistance to the moisture and tannic acid which form in damp sawdust. Further, clay pipe is practically impervious to erosion and to penetration of wood particles coming into contact with the duct walls at high speed, thus reducing friction losses in the system to a minimum.

The fan-operated exhaust system creates an air current of 13,000 cfm—a velocity of 51 mph through the ducts.

VITRIFIED PIPE SYSTEM (left) is laid below ground as exhaust duct for wood dust and shavings in 40,000-sq-ft extension of woodworking factory in Akron, Ohio. Lateral pipes (right) of lesser diameter connect machine risers to main 21-in.-dia ducts. Clean-outs at regular intervals, flush with floor, provide for cleaning of ducts to prevent clogging. Piping is laid at minimum depth of 8 in. from surface of 4-in. concrete floor.

Arch Roof Construction Provides Large Column-Free Area

CHOSEN FOR ITS EFFICIENCY in providing the large column-free area required to maneuver modern fire-fighting equipment, a thin shell arch-type reinforced concrete structure to be used by the New York Fire Department for motor vehicle and equipment repair is nearing completion in Long Island City, N.Y.

The central interior portion of the building consists of an unobstructed area 121 × 490 ft. The height to the crown of the curved roof from the finished floor is 35 ft, and at the springing line the vertical clearance is 12 ft. Flanking the central structure along either side for the full 490 ft are two 39-ft-span lean-to's, also of concrete shell construction. The lean-to spans provide space for woodworking, foundry, upholstery and various other shops. At both ends of the main portion of the building are two-story conventional beam-and-slab type structures for office and storage space.

In general, the roof and its supporting structure consist of a series of similar monolithic units. The superstructure of each unit is made up of a thin curved slab, two supporting arch frames, and small ribs along the free edges of the shell serving as stiffening members. Each unit is 70 ft long (measured longitudinally). The supporting arch frames are spaced 35 ft on centers with a 17-ft 6-in. cantilever at both ends of each arch unit.

All main arch frames, 5 ft 6 in. deep and 2 ft wide at the crown, with construction joints on the column at the springing line, are hinged at the floor level, the horizontal thrust being carried to tension ties placed in trenches beneath the floor slab. These ties are prestressed to the dead-load thrust by means of hydraulic jacks as the centering is removed.

To provide a smooth ceiling the arch ribs are placed outside the roof slab which is $3^3/_4$ in. thick increasing to 6 in. where it frames into the sup-

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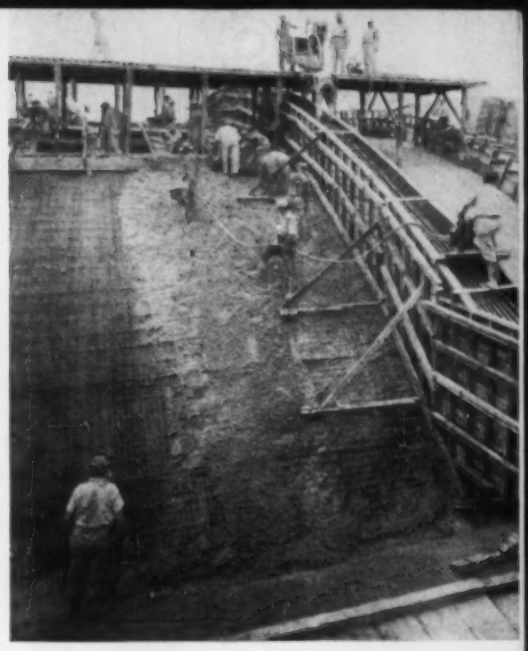
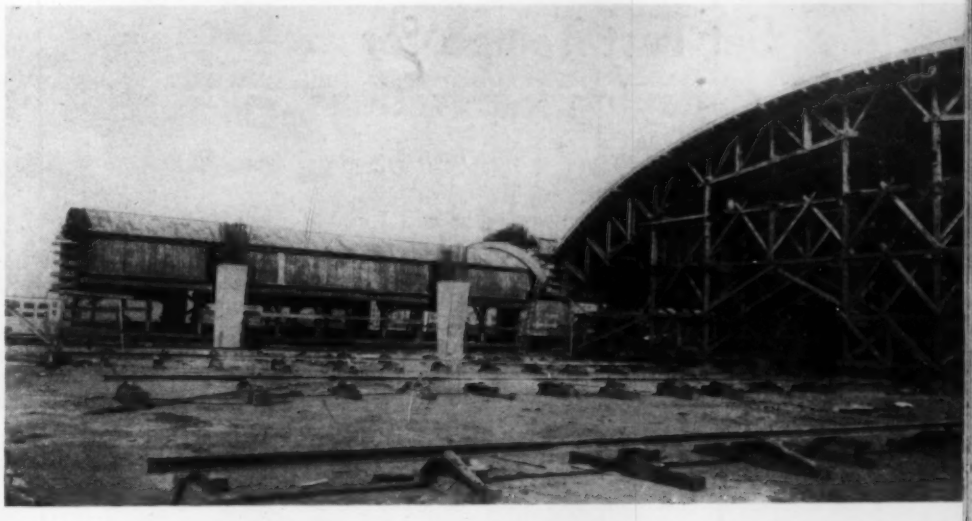


REINFORCING FOR $3^3/_4$-in.-thick slab consists of welded wire mesh with additional reinforcing at critical points. Supporting arch ribs, 5 ft 6 in. deep and 2 ft wide at crown, are located above roof slab to give unobstructed interior. Concrete vibrators are used to insure uniform placement of high early strength cement for roof slab and ribs.



TRAVELING FALSEWORK constructed for first unit is lowered an inch or two by means of screw jacks and moved forward for pouring of adjacent units. In background of photograph, falsework for lean-to has been moved into position for next pour. Hinged edges of forms are lowered to clear columns as falsework is moved out.

UNOBSTRUCTED INTERIOR (below, left) is 490 ft long by 121 ft wide, with 35-ft clearance from floor to crown of arch. Lean-to, arch-roof workshop areas, 39 ft wide, are seen on each side of main arch. Exterior-rib design makes smooth ceiling possible. General arrangement of large and small shell structure is seen in aerial view (below, right). Stiffener ribs at ends of cantilever projections, 17 ft 6 in. either side of main arch units, can be distinguished from main ribs. Openings in roof shell provide for chimney, skylights or ventilators.

EQUIPMENT POOL for fast-moving operations on ordinary pipeline spreads includes many specially designed machines, adequately powered to handle their particular phase of the work. Ditching and welding machines—essential pipe-laying equipment—do not appear in above picture of Williams Brothers Corp. yard at Neoga, Ill.

DIFFICULT TERRAIN presents no insurmountable obstacle in constructing 20-in. pipeline of East Ohio Gas Co. View shows trench immediately before backfilling.

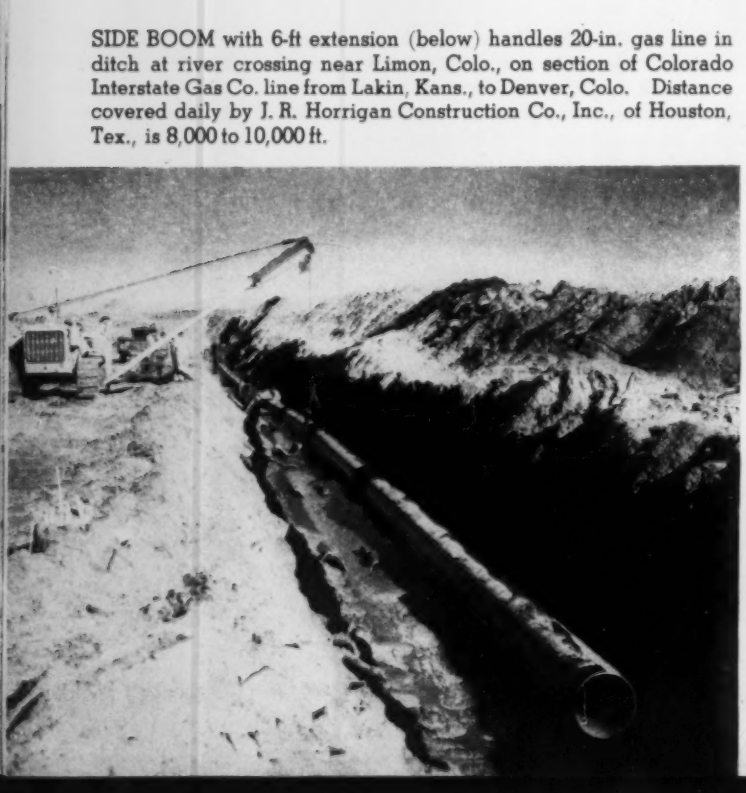
New Machines and Methods Set Fast Tempo for Pipe-Laying Operations

MODERN METHODS FOR CONSTRUCTING the pipelines that carry vital supplies of oil and gas over thousands of miles of rugged terrain call for a varied assortment of special equipment—machines built to perform difficult assignments on fast-moving jobs.

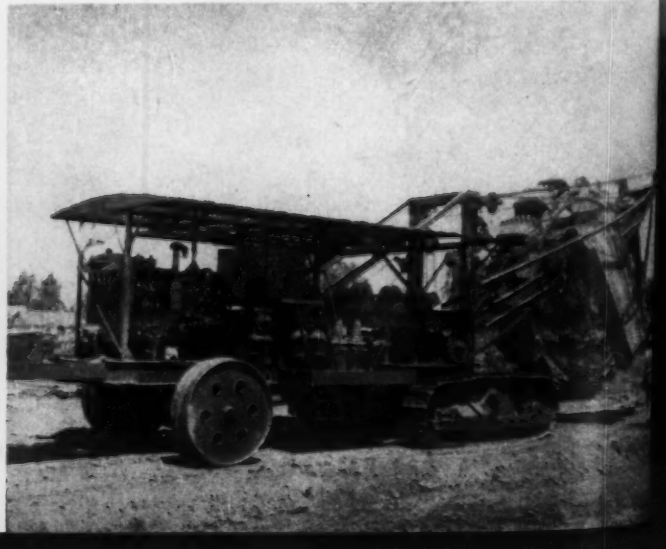
In combating time, the elements, stubborn rocks and loose sand, pipeline crews must do more than dig trenches and lay pipe. Men and machines must clear rights-of-ways of trees and brush; hills and streams must be crossed and paths made for proposed trenches. These

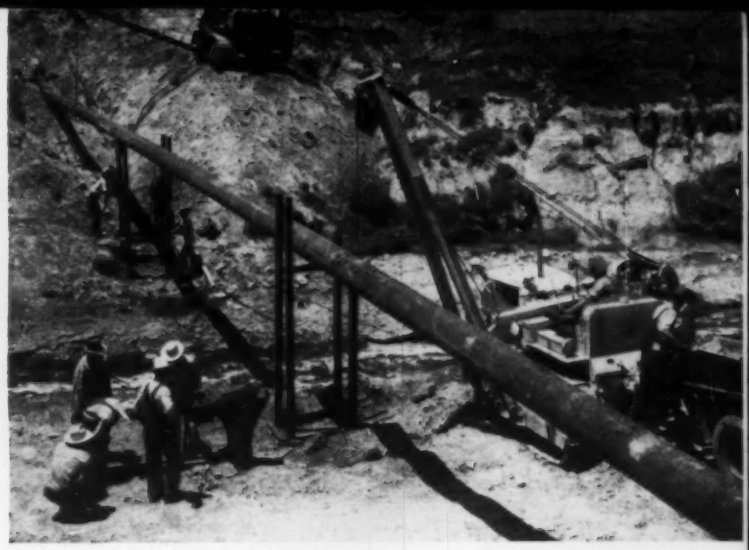
DIESEL-POWERED BACKHOE (above) digs trench in rocky soil on 300-mile 8-in. gas line between Marcus Hook and Midland, Pa.

SIDE BOOM with 6-ft extension (below) handles 20-in. gas line in ditch at river crossing near Limon, Colo., on section of Colorado Interstate Gas Co. line from Lakin, Kans., to Denver, Colo. Distance covered daily by J. R. Horrigan Construction Co., Inc., of Houston, Tex., is 8,000 to 10,000 ft.



MAMMOTH DITCH DIGGER, weighing approximately 50 tons, cuts ditch 2.5 ft wide by 9.5 ft deep at rate of 7.5 ft per minute. Equipment, powered by Caterpillar Diesel D 13000 engine, is intended for Bessarabia where Williams Brothers Corp., designers and fabricators of machine, have contract for oil pipeline.



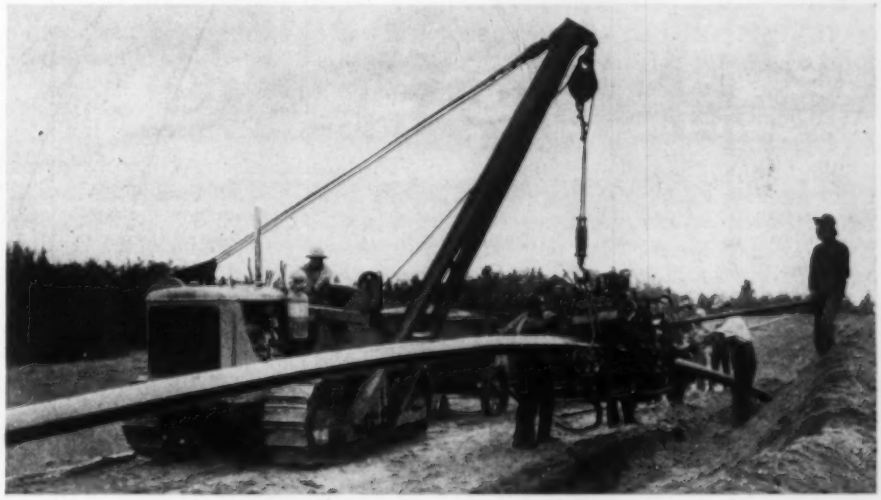


LARGE PIPELINE—20 in. in diameter and weighing 90 lb per ft—is removed from creek bed because of excessive corrosion caused by seepage of waste waters from steel mill upstream. Crane and side-boom equipped tractors (above, left) place pipe on supports consisting of railroad rails driven into ground. Pipe rests on short rail sections welded to uprights (above, right). Crossing is on line of Colorado Interstate Gas Co. near Pueblo, Colo.

operations, plus the task of supplying a fast-moving project with materials of construction, add many pieces of equipment to the machines essential to pipe-laying operations.

Accompanying illustrations show a typical equipment pool for an ordinary pipeline spread and illustrate several difficult operations which have become routine through the use of adequately powered, specially designed machines.

The important role played by modern equipment in expediting removal of a 20-in.-dia gas pipeline from beneath a swift-flowing creek to overhead supports to provide trouble-free uninterrupted service to users is also shown in accompanying views.



COPING AND WRAPPING operation (above, right), following that of cleaning and priming, immediately precedes backfilling of trench. Ample power and positive control permit careful handling as pipe settles into trench. Line will carry natural gas to towns between Viking and Red Deer, Alberta, Canada.

LARGE DITCHER (right) is practically suspended by tow cables from winch-equipped tractors at top of slope. Work is that of Williams Brothers Corp. laying 20-in. pipeline for East Ohio Gas Co.

THROUGH KNEE-DEEP MUD covering underlying rock that must be blasted (below), compressor is moved into place. D7 tractor equipped with Hyster winch is used by Whitaker Contracting Co. for miscellaneous hauling and clearing as well as for hauling pipe-stringing trucks up and down heavy grades on 8-in. gas line between Marcus Hook and Midland, Pa.

Grass Stabilizes Sand on 4,900 Acres of New York's Idlewild Airport

NEW YORK INTERNATIONAL AIRPORT, located at Idlewild in the southeast corner of the Borough of Queens, has just recently acquired its sixth runway. When completed, this giant airport operated by The Port of New York Authority will be nine times as large as LaGuardia Airport. Already $60,000,000 of city funds have been invested in the construction of the project since its inception in April of 1942. The six concrete runways, which vary in length from 6,000 to 9,500 ft, are 200 ft wide and are built of reinforced concrete 12 in. thick. Extensive drainage, water supply and communication systems are nearing completion; 1,600 houses formerly in the construction area have been removed from the airport; and nearly finished is an underpass that will separate taxiing planes from the automobiles entering the central area.

MADE UP LARGELY of marsh and meadowland, the original airport site at Idlewild has been covered with 65,000,000 cu yd of sand fill dredged from Jamaica Bay—the largest hydraulic-fill operation of its kind ever undertaken. From the beginning, this huge quantity of sand, transferred from the bottom of the bay and spread over the field's 4,900 acres, has presented a problem in stabilization. The large flat expanse is subject to winds from all directions and the dry sand is quickly set in motion.

Only a complete vegetative cover such as beach grass can hold the drifting, migrating and shifting beach sand. The entire history of sand stabilization along the shores of Long Island and along similar stretches of seacoast as well as extensive research, experimentation and comprehensive plantings of thousands of acres at Jones Beach, Fire Island and other seashore localities, have borne out the fact that sand control can best be achieved by means of this native wild grass supplemented by a small percentage of poverty grass.

Beach Grass Has Widespread Use

The stabilization of sandy areas along both seacoasts of the United States and Europe has been successfully handled for many years by digging, dividing, and replanting beach grass (*Ammophila arenaria* and *A. breviligulata*). The early farmers along the Massachusetts coast restrained the movement of sand dunes by planting this grass and were consequently relieved of the payment of taxes. Along the Pacific coast in the vicinity of the Golden Gate, in Oregon near the mouth of the Columbia River, and in other coastal places beach grass has been used to halt the inland movement of sand dunes and subsequent devastation of valuable forests and agricultural lands (see Circular No. 660, U.S. Department of Agriculture).

Lands in New Zealand that were overgrazed by sheep and subjected to sand movement were planted with beach grass which arrested the movement of shifting sand across fertile lands. On the North Sea coast along the low-lying shores of Holland, Belgium and Germany, this grass has been used to stabilize shifting sands. On Long Island in recent years it has been planted to retain sand dunes along the seacoast. Sand pumped from the bay bottoms has been stabilized to make usable land in connection with the development of Jones Beach State Park, the Ocean Boulevard and both causeways leading to Jones Beach. In Jones Beach alone, over 3,000 acres of beach sand were successfully stabilized with beach grass.

Since its earliest use, the only improvement in the handling of beach grass has been the development of the multiple-row planting machine which has successfully replaced hand methods for large-scale operations such as the one now in progress at New York International Airport. This machine is an adaptation of the tobacco planter used in the Connecticut Valley, and the cauliflower planting machines in common use on Long Island.

Beach grass when planted with proper spacing and vigorous divisions of plants not only stops sand from blowing by lifting the wind to the tops of the plants (approximately 18 in.) but also, when left to grow un-

SIX-ROW beach grass planting machine is adaptation of tobacco and cauliflower planting machines in common use. Machine can plant 20,000 beach grass plants on one acre in about two hours as compared with same coverage by 20 men in an eight-hour day.

SAND FILL AT NEW YORK INTERNATIONAL AIRPORT at Idlewild—spread over field's 4,900 acres and subject to winds from all directions—is stabilized by planting of 10 percent poverty grass and 90 percent beach grass. Photographs show (left) grass three months after planting and (right) 15 months after planting.

disturbed after planting in the proper season, results in a permanent mat of vegetation that prevents the movement of sand. It is only when planted areas are disturbed by storms, high tides, hurricanes or construction operations, that the sand is once again vulnerable to erosion by wind. Under such circumstances speedy replanting is necessary to prevent blowouts and migration of dunes.

Beach grass when properly planted will grow unassisted by fertilizer, and for this reason fertilization was omitted at the New York Airport. Fertilization is used for the primary purpose of forcing the grass into vigorous growth in order to make available local collecting areas for plants when their transportation from outside collecting sources presents difficulties. It is also practiced in soil conservation projects where fresh supplies of plants are needed annually for repairs to storm-damaged dunes. Of course the benefits of fertilization in establishing local collecting areas can be realized only after the planting work has been completed.

Consideration was also given at New York Airport to the stabilization of wind-blown sand surfaces by treatment with oil sprayed from tank trucks or other equipment. A sample plot was tried but it was found that as soon as the volatile oils evaporated, the bitumen dried out, cracked, flaked and blew away. Frequent treatments with oil will stabilize sand for a given period, but it is a very costly procedure and will not produce permanent stabilization. This method will also interfere with the subsequent planting and growing of beach grass to obtain permanent control.

Poverty Grass Also Used

Poverty grass (*Andropogon Virginicus* var. *littoralis*) is native to the sandy plains areas of the Atlantic States and is common on the Hempstead Plains and other sandy loam areas of Long Island easterly to Montauk. The variety *littoralis* is native to the seashore and is found very extensively along the Ocean Boulevard and causeways to Jones Beach. During the 20 years of soil stabilization work along the ocean bay and sound fronts, the Long Island State Park Commission has stabilized more than 4,000 acres.

The first step in stabilization work was the planting of beach grass (*Ammophila arenaria*) by hand planting or machine methods. It was observed after about ten years that this grass made a less vigorous growth when planted in coarse sand or when the sand was no longer in movement. With the lessening in vigor of some of the beach grass plantings it was observed that poverty grass was seeding and spreading very rapidly until now it is widespread throughout Jones Beach. Poverty grass was collected and planted by the New York State Park Commission in a few areas on Southern State Parkway 13 years ago and made a satisfactory growth.

(*Continued on page 78*)

Highway Proves Adequate for Heavy Haul

TOO WIDE FOR TRANSPORTING BY RAIL, 31-ton half-section of steel throat ring is hauled 40 miles by highway on 16-wheel low-bed trailer. Huge 14-ft-wide ring—transferred from plant of Lukens Steel Co. at Coatesville, Pa., through Downingtown, to Sun Shipbuilding Co. yards at Chester, Pa., for heat treatment—will form frame for 45,000-hp propeller-type turbine at Wheeler Dam on northern Alabama's TVA system. Turbine is under construction at Baldwin Locomotive Works, Eddystone, Pa. Transportation of ring, dubbed "Operation Monster," proceeded over specially selected route, under state highway department permit after careful check of all bridge capacities and clearances. Autocar tractor, with 164-in. wheelbase, and Rogers semi-trailer handled unusual hauling assignment.

Comprehensive Parkway System Provides Essential Traffic Arteries for Long Island

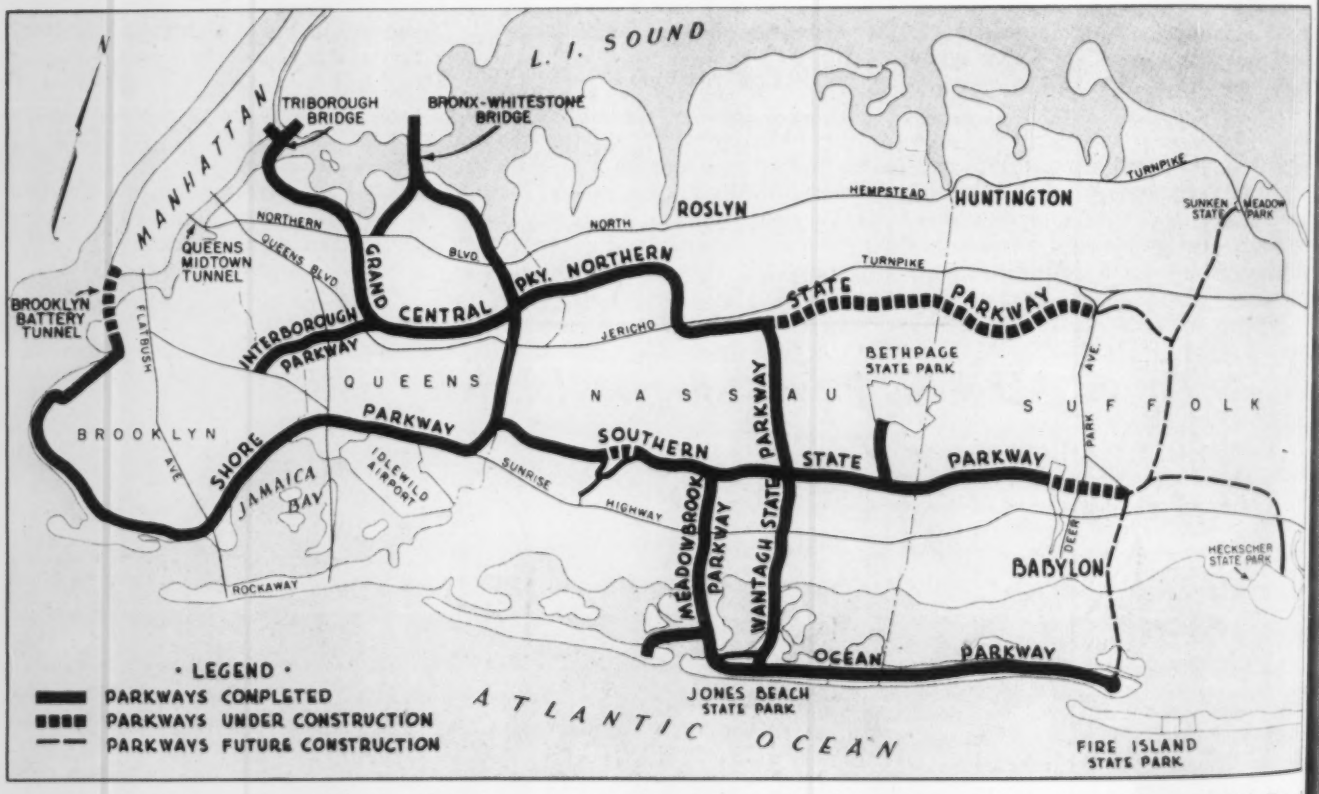
System Has Record of 2.5 Fatalities per 100 Million Vehicle Miles as Against National Average of 11.5

SIDNEY M. SHAPIRO, M. ASCE
Deputy Chief Engineer, Long Island State Park Commission

TWENTY-TWO YEARS AGO the need for arteries of travel free of congestion had become one of the most pressing factors in the orderly development of the entire New York metropolitan area. Travel into the city from Long Island was hopelessly throttled. To have further delayed the establishment of an arterial network would have been a major civic blunder. The program was finally launched and a pattern was established for an unparalleled arterial system made possible by the cooperation of federal, state, city, county and other authorities who have provided the leadership as well as the necessary lands and funds.

With the exception of 20 miles now under construction at the easterly extremities of the system, this entire comprehensive network is in use in the Counties of Kings, Queens, Nas-

CONTRAST OF UNCOLORED CONCRETE in decelerating lanes and curbs with dark pavement provides added safety to traffic on Northern State Parkway, Nassau County, Long Island. Pavement concrete colored with carbon black blends in with landscape effect and reduces glare for daytime driving. Funnel-shaped entrances to main roadway prevent simultaneous entrance of more than one car.



LONG ISLAND STATE PARKWAY system, 158 miles long, is tied together at west end by belt system in Brooklyn and Queens with Grand Central and Interborough Parkways serving as inner spokes. Arterial connections across East River and Long Island Sound are provided by Triborough and Whitestone Bridges, Queens Midtown Tunnel and East River bridges. Brooklyn-Battery Tunnel, now under construction, will form important link in over-all system. Northern and Southern State Parkways are being extended total of 20 miles eastward into Suffolk County. Grading operations are completed, bridge construction is moving rapidly and placing of concrete pavement is under way.

sau and Suffolk, over 20,000,000 cars a year traveling over it at the city end and 9,000,000 a year in Nassau County. The population in these four counties is 4,900,000 persons.

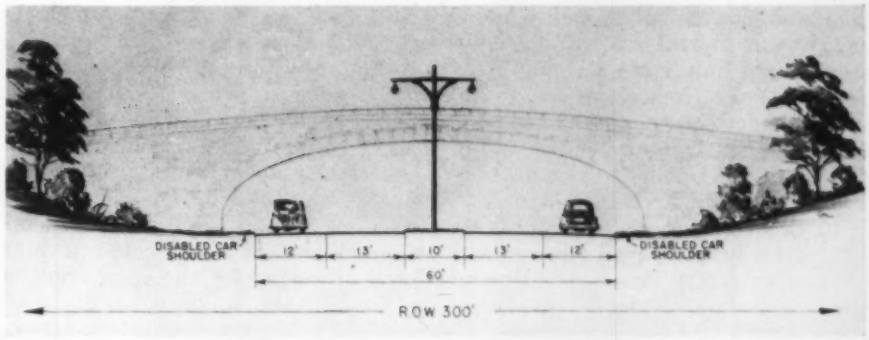
The cost of the system to date, exclusive of land, is $108,000,000. Design and construction were supervised through a coordination of the activities of the Long Island State Park Commission, the State Department of Public Works and the New York City Department of Parks.

Freed of crossings at grade by the construction of 291 stone-faced reinforced concrete bridges, the parkways are of controlled-access design having no abutting access except at entrances and exits at regulated and infrequent intervals. A mantle of zoning protects the right-of-way blocking undesirable development of private property adjacent thereto.

Basic principles of design include 8-in.-thick reinforced concrete pavement colored with carbon black, with outside lanes 12 ft wide and inside or passing lanes 13 ft wide; accelerating and decelerating lanes of uncolored concrete at exits and entrances; funnel-shaped entrances to the main roadway to prevent simultaneous entrance of more than one car, and mountable curbs of white cement. Shoulders 10-ft wide and level, are carved out of the landscaped side slopes to provide a space for disabled cars off the main concrete roadway. This feature is a "must" in all parkway design. Footpaths are also provided to keep pedestrians off the traveled roadway, particularly through built-up communities, with benches placed at suitable intervals. Improved lighting is also a requisite.

These items of engineering design combine to provide a complete and satisfactory artery from the point of view of traffic engineering and safety, with a record of 2.5 fatalities per hundred million vehicle miles as against a national average of 11.5.

One of the most important economic benefits of the parkway system is in the enhancement of property values adjacent to the parkway. It is a well-known fact that the increase in taxable values in Westchester County and on Long Island following the establishment of the parkway sys-



GRADE SEPARATION STRUCTURES eliminate all crossroad intersections at grade, in some cases combining two adjacent crossroads over single structure. Interchanges are confined to bridges at intersections of relatively important arteries. Illustration shows typical cross section of modern design used on Long Island State Parkway system. Features include divided pavement, white mountable curbs along darkened concrete pavement, level shoulders for disabled cars, grade-separated crossings, accelerating and decelerating lanes at entrances and exits, single-lane entrances, highway lighting and pedestrian paths.

STONE-FACED REINFORCED CONCRETE BRIDGE on Northern State Parkway Extension in Nassau County is one of 24 such structures now being built. Long Island Parkway System has 291 bridges of similar design.

JONES BEACH STATE PARK, major objective tapped by Long Island State Parkway System, is reached by two causeways from mainland. Placing of 40,000,000 cu yd of hydraulic fill in reclamation of original isolated barrier reef makes resort available to over 4,000,000 people annually. Parking facilities accommodate 15,000 cars. Fairchild Aerial Surveys, Inc., photo.

tem was enormous. A well-planned parkway is a great asset to the community not only from a traffic viewpoint but also from civic, health and esthetic viewpoints. People are attracted to the community because of the parkway facility and are encouraged to put up better homes.

In this connection, assurance that the parkway will always serve as a landscaped artery for non-commercial traffic maintaining the high value of the residential area it traverses, is provided by state law which includes in the appropriation acts the stipulation that "All such parkways, excepting such service roads, shall be maintained as parkways restricted to pleasure vehicles and without access except at designated points. Parkway service roads shall be open to mixed traffic." This makes it impossible to change the character of the parkway by local law to permit usage by commercial vehicles.

Private property adjoining the parkway right-of-way in practically all cases is zoned for residential purposes. Business frontage is limited principally to adjacent corners and cross-roads and streets. The Park Commission has advocated a high level of zoning for the strip immediately adjacent to the state right-of-way.

Most towns in Nassau and Suffolk Counties have adopted residential zoning for areas within 1,000 ft of the parkway right-of-way and requests for variances or changes of zoning in these areas are vigorously opposed by the Commission. Billboards and advertising signs are prohibited along the parkway system. No signs within 500 ft of the right-of-way outside the city limits or within 200 ft inside the city limits can be erected without approval of the park authorities.

Together, the entire unified network provides an arterial system on Long Island serving the suburban communities, parks and beaches, carrying heavy loads of traffic in and out of the city with reasonable speed, safety and comfort on an attractive right-of-way, all forming a comprehensive park and parkway system for the use of the people of the metropolitan area.

Abstracted from paper presented at Thirty-Third Annual Meeting of the American Association of State Highway Officials.

Reflector-Type Lane Dividers Effectively Channelize Highway Traffic

CORRUGATED WHITE CONCRETE TRAFFIC MARKERS and reflector curbs are effective means of channelizing traffic on heavily-traveled six-lane highway in Passaic County, N.J. Highly visible day and night, wet or dry, corrugated separators have additional safety feature of providing audible warning to drivers who tend to veer into adjoining lanes. Construction of marker consists of placing regular gray concrete in 2-ft-wide space between lanes for full depth of slab except for top 1 in. which is filled with white concrete. Corrugations are made with hand scoring tool while concrete is still plastic. Lane divider is flush with surface of adjoining lanes. This new contribution to highway safety is largely result of continuous research and testing by the New Jersey State Highway Department. Photos courtesy Universal Atlas Cement Co., N.Y.

Engineers' Notebook

Angle Trisected by Graphical Methods

JAMES B. GOODWIN, M. ASCE
Toronto, Canada

ALTHOUGH FOR MANY YEARS scientists and mathematicians have tried without success to solve the problem of trisecting an angle, and despite the fact that it has been proved mathematically that the angle cannot be trisected, two methods that present near perfect solutions are outlined here. Trisection of angles by either method gives a degree of accuracy equal to that of any other graphical solutions that depend upon the skillful use of drafting tools.

First Method

In Fig. 1 the angle α is to be trisected: With center A and radius 3 describe arc BC. Extend radius to a value of 4, to D. Draw DE parallel to AC. With center D and a radius of 4, draw arc BE. Divide arc BE into four equal parts by bisections. It is evident that $^3/_4$ of arc BE is equal to the total arc BC with radius 3, and too, that $^1/_4$ of arc BE is equal to the arc for $^1/_3\ \alpha$ with radius 3.

Divide $^3/_4$ of arc BE and the arc BC into, say, eight equal parts. Choose the two divisions next to the $^1/_3$ point, viz. $^2/_8$ and $^3/_8$ of arc BE, one on either side. Rotate the arc AC to position at $^2/_8$ or $^1/_4$. Lay off $^1/_{16}\ \alpha$ below AB and draw A_xx parallel to it. Since the net change of angle for radius AB to A_xx is the difference between the change of the larger arc and the angle rotated by the inner arc, $^1/_4\alpha - (^1/_4 \times {}^3/_4\alpha) = {}^1/_{16}\alpha$. The radius A_xx intersects the arc at x, which is a point on a hypocycloid.

Establish point y from position at $^1/_8$. Join x and y. These points may be checked by pointing off from the arc BC, as the ends of the arc are known. With arc at position P, the arc would intersect the line xy at z and thus establish the arc Pz for $^1/_3\ \alpha$. Of course, the points x and y are on a curve but since the arc Pz intersects at about $^2/_3$ ± of the distance from x to y, the difference between a straight line and curve is hardly discernible by drafting, particularly so since the hypocycloid is a very flat curve at these points.

The difference between the actual and theoretical may be given as $\delta\alpha$, which is as near to zero as may be! It may also be stated that if the arc ($^3/_4\ BE$) and the arc for α be divided into, say, 16 or 32 points, the accuracy becomes almost perfect although perhaps difficult to show by drafting. By pointing off the arc Pz to BP_1, it becomes the arc for $^1/_3\ \alpha$ in its original position.

Second Method

The second method of trisecting an angle is based on the use of arcs with constant chord and varying radii.

It is evident that various and equal parts or factors of angles of 45 and 60 deg may be trisected by use of bisections, and an almost infinite number of combinations is possible to produce as many points of trisection to be joined, as in the first method, by infinitesimally short straight lines. This may be illustrated by Table I.

By combining any of these by addition and subtraction it is evident that a sufficient number of angles may be found to fulfill their requirements. Thus $3° 45' + 3° 16' 52^1/_2'' = 7° 1' 52^1/_2''$, which is $^1/_3$ of $21° 5' 37^1/_2''$, and $3° 45' - 3° 16' 52^1/_2'' = 0° 38' 07^1/_2''$, which is $^1/_3$ of $1° 24' 22^1/_2''$, and so on indefinitely. The values of these angles are given in degrees merely to clarify the process, all of which, however, may be accomplished by compass and ruler without giving angles in degrees.

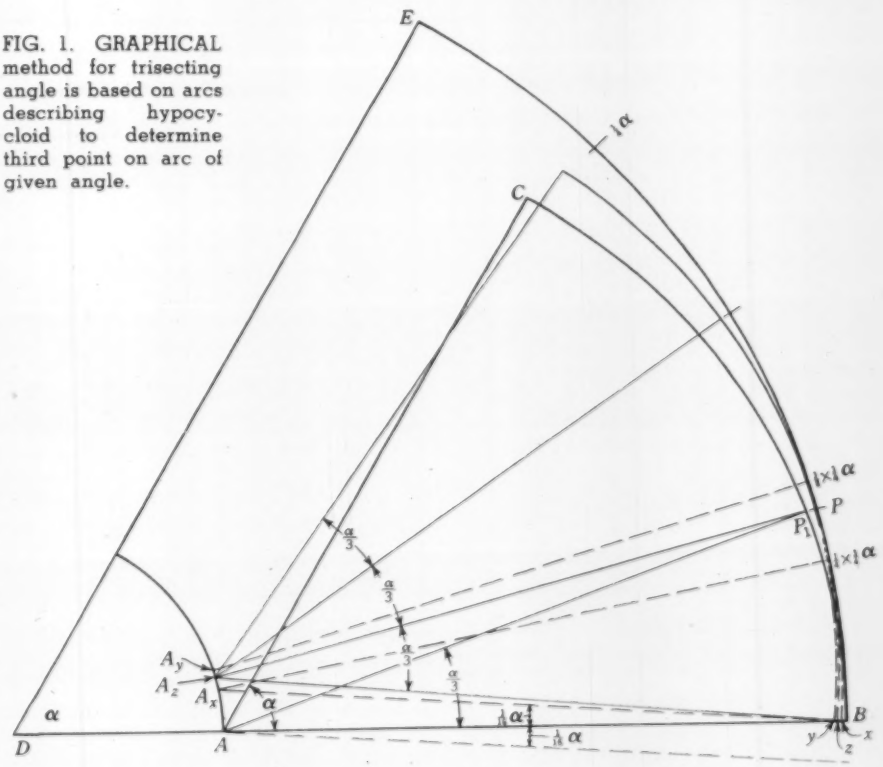


FIG. 1. GRAPHICAL method for trisecting angle is based on arcs describing hypocycloid to determine third point on arc of given angle.

TABLE I. FACTORS OF 45- AND 60-DEG ANGLES

180°	= 3 × 60°	157° 30′	= 3 × 52° 30′ and 52° 30′ = 45° + 7° 30′
90°	= 3 × 30°	78° 45′	= 3 × 26° 15′
45°	= 3 × 15°	39° 22′ 30″	= 3 × 13° 07′ 30″
22° 30′	= 3 × 7° 30′	19° 41′ 15″	= 3 × 6° 33′ 45″
11° 15′	= 3 × 3° 45′	9° 50′ 37½″	= 3 × 3° 16′ 52½″
135°	= 3 × 45°	112° 30′	= 3 × 37° 30′
67° 30′	= 3 × 22° 30′	56° 15′	= 3 × 18° 45′
33° 45′	= 3 × 11° 15′	28° 07′ 30″	= 3 × 9° 22′ 30″
16° 52′ 30″	= 3 × 5° 37′ 30″	14° 03′ 45″	= 3 × 4° 41′ 15″
8° 26′ 15″	= 3 × 2° 48′ 45″	7° 01′ 52½″	= 3 × 2° 20′ 37½″

In Fig. 2 the third points of arcs with the common chord AB are shown for angles differing by 22° 30′, and the third points of these angles are joined by a flat curve. For practical use no other intermediate angles are necessary although theoretically available.

Where the angle to be trisected is small such as, say, 5 deg as shown in the sketch, the center for the arc with the chord AB would be too distant, so 90 deg is added to the angle to be trisected. After trisecting the small angle plus 90 deg, lay off 30 deg and the balance is the third part of 5 deg. This is shown in the sketch by dotted lines.

The actual value of the small angle is given in degrees which, however, is not permitted by the method of Euclid, but it is done to differentiate the process relative to the other angle in the sketch and to more clearly visualize the method. The angle could as well be called α, β, or any unknown value.

To determine the center for the arc for 90° + α or β, it is only necessary to start with a point on the horizontal axis, say, well to the left, to avoid confusion and lay off $\frac{1}{2}\alpha$ above this line. Add to this 45 deg or $\frac{1}{2}$ of 90 deg.

Through B draw a radius parallel to this line and it will intersect the horizontal axis at the center for this arc, and the arc cuts the angle at the third point at the intersection of the controlling line for all trisections.

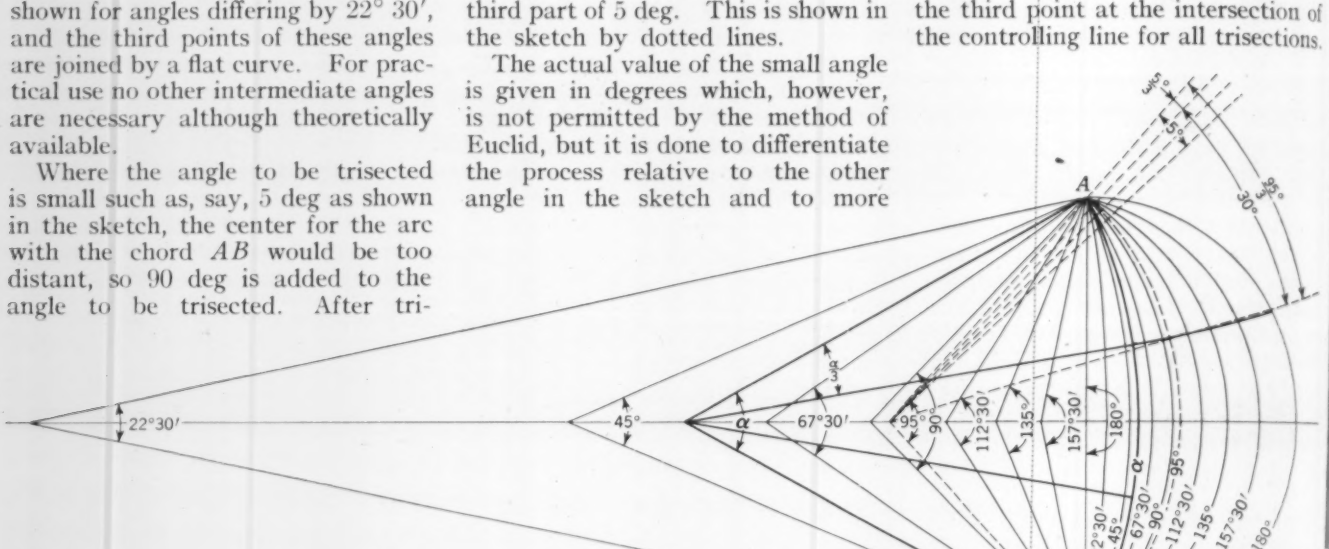


FIG. 2. SECOND method for trisecting angle uses arc with constant chord and varying radii to establish third point on arc of given angle.

Navy Constructs Precast Concrete Bungalows

SINGLE-STORY DUPLEX bungalows of thin precast reinforced concrete panels are being constructed by the Naval authorities at Guam for familes of enlisted men stationed at that base. Developed for other types of building during the war, and found cheaper, more efficient and saving in lumber, precast concrete construction is found adaptable to personnel buildings at advance bases where shipment of materials is an important factor. Materials are shipped in bulk, and wall panels and roof slabs are cast, finished, surface treated and cured at the site.

The bungalows are designed to resist earth tremors, typhoons, fire, insects and rodents. Roof slabs are supported at the center on a continuous ridge beam resting on a center party wall and an inside and outside column. The roof, which has a wide overhang, is covered by a built-up asbestos felt over rigid insulation.

PRECAST CONCRETE single-story duplex bungalows at Guam Naval base, illustrated here by model, are of modern design specifically developed by Navy Bureau of Yards and Docks for housing island-based Navy families. Center ridge beam of structure rests on party wall and on inner and outer columns. Accommodations consist of living room, dining room, two bedrooms, kitchen and bathroom with concrete floors. Partitions between rooms are of ¾-in. plywood. Screened jalousies extending from floor to ceiling take place of windows.

...THE READERS Write

Outlines Simplified Cost-Keeping Method for Contractors and Builders

To the Editor: The able discussion by A. O. Babb, Assoc. M. ASCE, in the August 1947 issue, ranks current and adequate cost records as the first tool of management. Much has been written about cost systems for mercantile and manufacturing enterprises with permanent location, persistent personnel and repetitive product. Such enterprises have a comparatively smooth performance and do not demand the current control of day-to-day operations which is so essential in construction. They also admit a degree of refinement and detail which becomes absurd and prohibitive to the contractor. Most accountants, not understanding construction practice, install cost systems which are not immediately responsive and are far too complicated for successful operation. The average contractor and builder needs a cost system which is inexpensive to install and economical to maintain. Let me describe such a system that has been in actual use for many years.

Some 25 years ago the Contractors' Association of Northern California, now a chapter of the Associated General Contractors of America, made a study of classification codes and forms and prepared for its members a small handbook of suggestions for cost-keeping. This early recognition of the need for orderly records preceded the extensive mechanization of construction and the increasing practice of subcontracting to specialists. Now it is desirable to make separate notations of charges arising from these developments. I have found that all charges of whatever kind may be segregated under one of the following five heads: Labor, Materials and Supplies, Equipment Rental, Subcontracts and Sundry Expense, and these heads follow through the three coordinated forms which comprise a cost-keeping system.

The first step in competitive contracting is the preparation of a detailed estimate of cost. This is facilitated by an Estimate Form wherein each operation is broken down into the five groups of charges mentioned. A complete analysis of the job by the estimator implies a tentative procedure for performing the work, a classification of the operations involved, which classification will be followed by the costing staff, and it also affords an appraisal of the financial risk taken in the various steps of performance which should be reflected in the bid. Assurance will be provided by a record of actual costs of previous similar operations under known conditions. There is much evidence that too many jobs are undertaken without a working plan and an adequate cost analysis based on that plan.

The second form is a Daily Cost Distribution. Procedure will be simplified by considering this form as an invoice register wherein every charge, including payroll, is an invoice, classified as to job and operation by a rubber stamp on the document, then entered in the appropriate column. The details of time taking, memoranda invoices for materials taken from company warehouse, and equipment rental charges for company-owned plant may vary, but it is essential that all charges be routed into the office daily for entering and posting by the clerical staff. Job overhead is treated as one of the operations, and general administrative overhead as a separate job.

A third form is a Cost Summary in which are segregated the cumulative charges against each operation under the same five heads. These are posted from the Daily Cost Distribution with suitable columns for progress made and unit costs. Pencil notations of estimated costs appear at the top of the columns, and serious deviation indicates the need of a conference between estimator and superintendent. At the conclusion of the job these data become an invaluable guide to the estimator and management for future bidding. This form is actually a subsidiary ledger, and consolidation of the segregated figures may be carried as far as desired before posting to the control account in the general ledger.

It has been stated that in the ordinary accounting system bookkeeping and cost-keeping are two distinct and separate procedures "and never the twain shall meet." But in such a system—or lack of system—there is no check on distributed costs and immediately they are suspected as incomplete or erroneous. In the system described, it is apparent that all charges go through the cost records to appear finally as debits under Jobs in Progress in the ledger, while the corresponding credits go directly into the ledger. Thus a trial balance checks the completeness and accuracy of the cost-keeping as well as the bookkeeping. Furthermore, simplicity and economy are achieved by the absence of duplication of entries.

An eminent engineer has defined our profession as "the science of making a dollar earn the most interest." This will never rank with the more classical definitions but it does direct attention to the business aspect of engineering and the important place of management in technical enterprises. Again I wish to say that current and adequate cost records are the first tool of construction management.

Arthur J. Grier, M. ASCE
Oakland, Calif.

Newspapermen Thank ASCE for Public Relations Help

Receipt of the letter quoted below was a unique experience, perhaps not often enjoyed by engineer society secretaries. The generous newspaper space and publicity afforded the Society and individual members during the past two years indicate the value of a competent public relations contact. The following letter from two newspaper reporters provides further indication of that fact. W.N.C.

Dear Colonel Carey: It was the pleasant experience of the undersigned to have drawn assignments from our respective papers to cover the 1947 Fall Meeting of the American Society of Civil Engineers now in session in our city.

Conventions and meetings, as a rule, present to the average reporter its usual problems, headaches and a lot of leg work.

Your meeting, however, is a rare exception. This we discovered when we met Mr. Allen Wagner and found much to our surprise he had everything in readiness for us. So much groundwork has been done by Mr. Wagner that we now find it a genuine pleasure to cover a national meeting.

Only last week we handled another national convention here and almost "took to drink" in our desperation to keep abreast of the proceedings.

We only met Mr. Wagner this week, and he has no knowledge of this letter. It is spontaneous on our part as we could not resist the opportunity to hand deserved credit where it is due. It is just another verification of the saying that "it takes a newspaperman to get along with the working press."

Douglas R. Eller
Reporter, Florida-Times-Union
James F. Massey
Reporter, Jacksonville Journal
Jacksonville, Fla.

Eccentric Wall Footing Presents Another Paradox

DEAR SIR: The article, "Scientific Approach Reveals Fallacies in Paradoxical Engineering," by Prof. S. F. Borg, in the July 1947 issue, presented several examples which seem "to further the claim that a part of a structure may be stronger than the whole structure." To Professor Borg's list there may well be added a paradoxical construction of frequent occurrence in building practice—the offset wall footing.

This type of construction, use of which is commonly dictated by property limits, is illustrated in Fig. 1, which shows three similar bearing walls, carrying equal loads, but supported by footings of different widths. For convenience, the weights of the footings are assumed to be included in the wall loads.

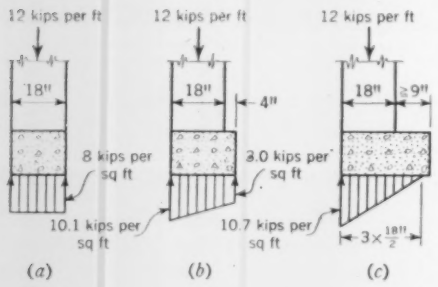


FIG. 1. THREE SIMILAR BEARING WALLS supported by footings of different widths show that bearing condition is theoretically worsened by increase in footing width.

The soil pressure diagrams, based on the customary assumption of straight-line pressure variation, reveal that an increase in the footing width does not decrease the maximum soil pressure but on the contrary *increases* it! That is, widening the footing worsens the bearing condition—at least theoretically. "A paradox, a paradox, a most ingenious paradox," to quote Gilbert and Sullivan.

This peculiar situation has long been recognized. The late Daniel E. Moran, M. ASCE, has this to say in Kidder-Parker's *Architects' and Builders' Handbook:* "While theoretically faulty, if not useless, it is indisputable that offset footings have generally served the purpose for which they were designed." Another instance of prim, beautiful theory clashing with rude, crude facts?

A possible explanation of the apparent contradiction between theory and experience may be as follows. If the maximum pressure under an offset footing becomes excessive, minor, local yielding of the soil may take place, accompanied by a slight tipping of the footing—e.g., counterclockwise for the footing of Fig. 1 (*b*) or (*c*). The wall load will then be delivered to the footing closer to the inside face of the wall, with consequent reduction in the maximum soil pressure.

Since the rotation of the footing can cause the wall to deliver its load almost at its inside face (possibly with some local crushing of the masonry at that location), it is evident that a considerable advantage in soil bearing conditions can result from the use of the theoretically useless or worse than useless footing projection. Unfortunately, at the same time, the wall is put into flexure by the now eccentric reaction at its bottom. A preferable solution for the eccentric wall footing problem lies in the use of reinforced concrete, as indicated in Fig. 2.

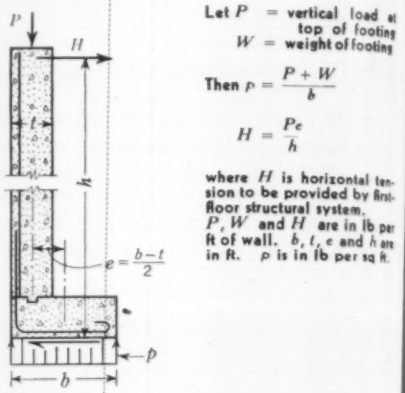

P
H
t
h
e = (b−t)/2
p
b
Let P = vertical load at top of footing
W = weight of footing
Then p = (P + W)/b
H = Pe/h
where H is horizontal tension to be provided by first-floor structural system.
P, W and H are in lb per ft of wall. b, t, e and h are in ft. p is in lb per sq ft.

FIG. 2. USE OF REINFORCED concrete overcomes objection to eccentric footing illustrated in Fig. 1.

VICTOR R. BERGMAN, Assoc. M. ASCE
New York, N.Y.

Engineers and Architects Asked to Work Together

DEAR SIR: The recent legal action of the Province of Quebec Association of Architects to restrict the activities of engineers in building design and construction is of particular interest at this time when the professional approach of trained technicians to their work is frequently maintained with difficulty in the face of increasingly strong pressure of the union movement to absorb technical activities.

Such friction between the architectural and engineering professions can only result in a loss of prestige to one or both.

Fortunately, between competent and discerning practitioners of both professions there exists—and should exist—a mutual respect for their individual abilities, based on the realization that no important building project has been, or can be, an outstanding success without the respective training, experience, and skill of engineers and architects coordinated toward a common result.

The chief function of the architect is to solve a particular problem of building construction in such a way as to achieve a structure or structures with the proper and harmonious balance of utility, strength, beauty, and economy. The beauty achieved by the competent architect is not only evident in the mass proportions, refinement of detail, color, and texture of a structure, but is also inherent in the basic symmetry and efficiency of the component parts of the plan, whether it be for skyscraper, dwelling, memorial, or factory; and if the project is of any magnitude, the conception takes material form through the skill of the engineer.

In such a project, the engineer must depend on the planning skill of the architect, the architect on the construction skill of the engineer. The item of utility commands the skill of the mechanical, the electrical, (and in the industrial field, the chemical) engineer; the item of strength, the structural engineer. Economy demands the attention of all.

It is a tribute to the modesty of the engineering profession that the structures which have made the creative conceptions of celebrated architects possible, and which have made their reputations secure, have been designed structurally, mechanically and electrically, by engineers who are anonymous, or generally unknown to the lay public. Yet the engineers, who have made magnificent skyscrapers a characteristic symbol of American ingenuity, might never have attempted such projects if not spurred on by the expansive imagination of the architect.

There are codes of professional ethics. There are license laws for engineers and architects, designed for the protection of the public in matters of safety, health, sanitation, and aesthetics. There should be no facts at issue between the professions. If either the practicing engineer or architect feels impelled to invade the field of the other, let him meet the legal requirements, and qualify for license in the field he desires to enter. If this course is followed, engineers and architects can cultivate the mutual respect of trained specialists for each other, a respect which will develop the harmony and solidarity of basic professions and establish them more firmly in the minds of a public at present confused with the high cost of building construction, and bewildered by the built-up, press-agented importance of such vocations as crooners, band leaders and movie stars.

ERIC FLEMING, M. ASCE
New Brunswick, N.J.

"Rod Waving" of Interest to Engineers of 1870's

TO THE EDITOR: Recent issues of CIVIL ENGINEERING have carried contributions in regard to "rod waving." Engineers may, therefore, be interested in the attached clipping from *The Railroad Gazette*, of May 2, 1874, in which the same subject is rather fully discussed.

C. S. LEET, Assoc. M. ASCE
Pittsburgh, Pa.

Editor's Note: That engineers are faced with similar problems over a long period of time has been called to our attention by other discussers. A case in point was the protracted discussion of vertical curves. But the deluge of discussions received in some of these elementary problems indicates the need for airing them periodically.

Each new generation of engineers seems to feel that it has new and better solutions to old problems. This is a healthy situation because once in awhile an ingenious suggestion helps many engineers solve a simple but time-consuming problem that has bothered them for years. However many older engineers recall published articles and textbooks that give better solutions to the many recurring problems faced by today's engineers than are provided in our current literature. A few excerpts from Mr. Leet's clipping from an 1874 issue of "The Railroad Gazette" are reprinted here to show that such discussions have changed little in 73 years.

"Of late I have noticed several articles in your paper treating on the methods of avoiding and 'Eliminating the Error in Leveling, from want of Perpendicularity of the Rod.' I have had some experience in leveling, and have tried 'swaying or waving' a rod, as mentioned by some of your correspondents, for the purpose of obtaining the 'shortest rod,' thinking that to be the one required. If the point of support of the rod was in the same vertical plane as the face of the target, then would this be a proper method of obtaining the true reading, and the reading thus obtained would be the 'shortest rod'; but as on some rods the face of the target is from 1 in. to 1¾ in. from the centre line of the rod, it can be easily demonstrated that a reading obtained in this way would be the 'shortest rod,' and that it would be less than the true distance between the planes."

"Whether the reading be great or small is of no consequence, provided that the rod be perpendicular when the sight is taken. The rodman can plumb the rod roughly by balancing it, after it is clamped, so that it shall stand alone for a moment while the leveler sights to the target and sees if it is right; and he will generally find that a rod plumbed in this way will give correct readings, provided that there be no wind and care be taken to balance the rod on the centre of its foot. But for careful and accurate work the rod should be made truly vertical by some means certain of accuracy in all cases. None of the methods described by our correspondents would answer with a Y-level, because the leveler would be able to plumb his rod only in one direction, and would have no means of knowing whether the rod leaned to the right or to the left. Now to plumb a rod accurately and conveniently take two heavy 30° triangles, nail them together at their longest edges with their shortest edges at right angles to each other; then upon these two shortest edges fix two small spirit levels. Fasten a strap to this contrivance and let the rodman sling it over his shoulder; apply it to the edge of the rod, and the rod may be plumbed easily and without loss of time. In principle this is nothing new."

Theories of Temperature Stresses Are Reviewed

DEAR SIR: The review of my book, *Natural Philosophy of Physics, Chemistry and Engineering*, in the November issue, does not bring up the general error of engineering textbooks in calculating temperature stresses in restrained steel structures twice their actual magnitude.

I think this would be covered better and more interestingly by a review of the old and new ideas of expansion.

When iron commenced to replace timber bridges (Burr trusses and town lattice-covered bridges), early iron viaducts embodied wooden struts to brace columns longitudinally because these early designers feared the expansion of iron struts might wreck the column.

Sixty years ago when L. S. Buffington (the writer's old associate) proposed a 28-story skyscraper office building, the editor of the New York *Sun* said it was probably the project of a crank, while the *Architectural News of New York*, in an editorial, said that apparently L. S. Buffington did not know of the expansion of iron. Iron was all right in its place, but not for framing high buildings, because the expansion of the iron frame would soon crack all the plaster and the building would be only a shell. Buffington patented his iron skeleton building with its shelf girders to carry curtain walls, as now embodied everywhere in tall buildings.

Fifty-odd years ago the Pottsville Iron and Steel Co. fabricated a round house for a Southern railroad, which was designed by the late C. Shaler Smith, M. ASCE. Smith had provided two or three hundred expansion joints with slotted holes for the roof frame, which today would be riveted up solid, ensuring greater strength and stiffness under wind pressure.

In the design of the Eads Bridge, temperature stresses were computed, as they are generally today, double the actual amount, as proved by the development of intermolecular forces in my *Thermo-Elastic Studies of Natural Philosophy*.

Metal bars under longitudinal stress expand more laterally than they do longitudinally, which renders the effect of the temperature change less than half it would be if the effect were the same in each direction. The notion that expansion takes place the same laterally and longitudinally, regardless of internal stress and condition, is an error of long standing.

Kelvin discovered that when a weight was suspended by an elastic band and a hot poker was brought near the band, the band contracted lengthwise and drew the weight up. From this phenomenon, he supposed he had discovered in the rubber a material that would contract under heat, notwithstanding the fact that the cubic expansion of the band was tens of thousands of times that of a wire supporting the weight when heated.

C. A. P. TURNER, M. ASCE
Columbus, Ohio

Suggests Painting Pavement Edge as Safety Device

DEAR SIR: Request for publication of this letter in CIVIL ENGINEERING is made in the hope of helping to save human lives. The increase in automobile speed has brought with it the blinding head lights that make night driving hazardous.

It is the writer's opinion that in driving at night the motorist is guided by: (1) highways signs, (2) painted center lines, (3) edge of pavement, (4) tail lights of traffic going in the same direction, and (5) head lights of traffic going in the opposite direction.

When blinding head lights appear, many drivers cannot see the other aids to night driving listed and thus have no guide. As everyone knows, it is dangerous to look directly at oncoming bright lights, and it also becomes dangerous to watch the center line. Thus the driver must keep his eyes to his right and be guided by the edge of the pavement, which in most states is not distinctly marked.

It is my suggestion that the edges of pavements be painted like the center lines. That would enable a driver, sitting on the left side of his car, to keep his eyes to the right on the painted pavement edge and away from the lights.

I pass this suggestion on to highway engineers or college professors of civil engineering who have the facilities for making a few mile test sections and determining the public's reaction to the scheme.

HERBERT L. PRANGE, Assoc. M. ASCE
Caruthersville, Mo.

SOCIETY NEWS

Society Prizes and Medals to Be Awarded

Ten Members Will Be Honored at Annual Meeting for Outstanding Papers

PRIZES AND MEDALS for outstanding contributions to ASCE publications will be presented by the Society at the opening session of its Annual Meeting in New York City, January 21, 1948. Oldest and most distinguished of these awards is the Norman Medal, established in 1872 by the late George H. Norman, M. ASCE, for an original paper considered an especially notable contribution to the profession. The award considered next in importance is the J. James R. Croes Medal, which was established in 1912 and named for the first recipient of the Norman Medal.

In 1884 the late Thomas Fitch Rowland, Hon. M. ASCE, endowed the prize bearing his name for a paper best describing in detail some accomplished work of construction. For the paper considered next in merit to that awarded the Thomas Fitch Rowland Prize, the Society in 1912 established the James Laurie Prize, which was named in honor of the first ASCE President.

The late Francis Collingwood, M. ASCE, established the Collingwood Prize for Juniors in 1894 on his retirement as Secretary of the Society. Papers eligible for this award must describe an engineering work or important investigation with which the author has been connected. Another governing factor in the selection of papers receiving this prize is excellence of style.

In a somewhat different category are the Division prizes, which also will be presented at the Annual Meeting. Oldest of these Division awards is the Rudolph Hering Medal, which was endowed in 1924 by the Sanitary Engineering Division of the Society, for the paper adjudged the most valuable contribution to the sanitary branch of the profession.

The Karl Emil Hilgard Prize in Hydraulics was instituted in 1939 as a result of an endowment left to the Society for the purpose by the late Karl Emil Hilgard, M. ASCE, of Zurich, Switzerland. This prize, consisting of a cash award of $50, is given biennially, and its administration is under the Hydraulics Division of the Society.

Established in 1943, the J. C. Stevens Award goes annually to the author of the best discussion of a paper in the field of hydraulics published in TRANSACTIONS. This award, which is also made on the recommendation of the ASCE Hydraulics Division, consists of books costing not more than $50, to be selected by the recipient.

BORIS A. BAKHMETEFF

BORIS A. BAKHMETEFF, co-winner of the Norman Medal, is an authority in the field of hydraulics. Dr. Bakhmeteff, Honorary Member of the Society and professor of civil engineering at Columbia University, has twice before been the recipient of Society prizes—the James Laurie Prize in 1937 and the J. C. Stevens Award in 1944.

Born in Tiflis, Russia, Dr. Bakhmeteff graduated from the Institute of Engineers of Ways and Communications in St. Petersburg in 1903, with the C.E. degree, and spent the following year at the Zurich Polytechnic Institute. In 1911 he received the doctor of engineering degree from the St. Petersburg Polytechnic Institute, where he served as professor of general and advanced hydraulics and water power engineering from 1905 to 1917. Coincidentally for part of this period (1907 to 1915) he maintained a consulting practice in St. Petersburg.

During the first World War, Dr. Bakhmeteff served with the Red Cross and was chief plenipotentiary of the Central War Industrial Committee to the United States and a member of the Anglo-Russian Purchasing Commission. Representing the Provisional (Kerensky) Government in the United States in 1917, he continued as ambassador of Russia until 1922. In 1923 he set up a consulting practice in New York City, which he still maintains. Since 1931 he has been professor of civil engineering at Columbia University.

Widely known as an authority in the field of fluid flow, Dr. Bakhmeteff has pioneered in the study of open-channel and varied flow, and of flow in granular media, in his laboratory at Columbia. His books include *Lectures on Hydraulics* (1912), *Varied Flow of Liquids* (1914), *Hydraulics of Open Channels* (1932), and *Mechanics of Turbulence* (1936). The latter work, which has been published in France in translation, recently won for Dr. Bakhmeteff the Grande Medaille de l'Association des Docteurs Ingenieurs de France. For his outstanding contributions in the field of hydraulics, the French government awarded him the academic degree of Officer of the Academy and Public Instruction. The paper, "The Mechanism of Energy Loss in Fluid Friction," which has been awarded the Norman Medal, was translated and published by the French government in one of its aeronautical series.

Dr. Bakhmeteff is a member of the Board of Consultants of the Panama Canal, appointed by the Governor of the Panama Canal Zone.

A member of the Society since 1917, Dr. Bakhmeteff was elected Honorary Member in 1945. He has served on the executive committee of the ASCE Hydraulics Division, and until lately as chairman of the Division's Committee on Hydraulic Research. Chairman of the ASCE Committee on Research, he represents the Society on the board of the Engineering Foundation and on the World Engineering Committee, and is a director of the Research Corp. He is ASCE representative on the council of the American Association for the Advancement of Science.

Other organizations in which Dr. Bakhmeteff holds membership include the American Society of Mechanical Engineers, the Institute of Aeronautical Sciences, the New York Academy of Sciences, the Connecticut Academy of Arts and Sciences, Tau Beta Pi and Sigma Xi. Interested in Engineers Joint Council activities, Dr. Bakhmeteff served as chairman of a special EJC panel on legislation for a National Science Foundation.

WILLIAM ALLAN

WILLIAM ALLAN, co-recipient of the Norman Medal, is professor of civil engineering and dean of the School of Technology of the City College of New York. Professor Allan was educated at the Polytechnic Institute of Brooklyn, graduating in 1924 with the degree of civil engineer, cum laude. Eight years later

BORIS A. BAKHMETEFF

WILLIAM ALLAN

Norman Medal for Paper, "The Mechanism of Energy Loss in Fluid Friction"

R. F. BLANKS

H. S. MEISSNER

Thomas Fitch Rowland Prize for Paper, "Deterioration of Concrete Dams Due to Alkali-Aggregate Reaction"

THOMAS R. CAMP

J. James R. Croes Medal for Paper, "Sedimentation and the Design of Settling Tanks"

ROSS M. RIEGEL

James Laurie Prize for Paper, "Structural Features of Hydraulic Structures"

F. L. EHASZ

Collingwood Prize for Juniors for Paper, "Structural Skew Plates"

A. L. GENTER

Rudolph Hering Medal for Paper, "Computing Coagulant Requirements in Sludge Conditioning"

MAURICE L. ALBERTSON

The J. C. Stevens Award for his discussion of Paper, "Evaporation from a Free Water Surface"

A. A. KALINSKE

Karl Emil Hilgard Prize for Paper, "Conversion of Kinetic to Potential Energy in Flow Expansions"

after a period of evening study, he received the degree of master of civil engineering from the same school.

Following his graduation, Professor Allan went through the "Loop" course of the Bethlehem Steel Co. at Bethlehem, Pa., and was employed for a year in the Bridge and Fabrication Department. He returned to New York in 1925 to become field engineer and, later, office engineer for Robert E. Carlin. In 1929 he became bridge designer for the New Jersey State Highway Commission in Jersey City, working on stress analysis and design of the river crossings and approach spans of the Pulaski Skyway. During the same period (1929 to 1932), he did graduate work in the evening at the Polytechnic Institute of Brooklyn and taught in both the graduate and undergraduate schools.

Early in 1933 Professor Allan joined the staff of the School of Technology of the City College of New York. Later, as director of the Hydraulics Laboratory, he designed new apparatus and made changes in equipment to modernize and

expand the laboratory. In 1937 he became assistant professor of civil engineering, and since 1940 has been chairman of the department of civil engineering. In 1943 he was made associate professor of civil engineering, and served as acting dean of the School of Technology for the year 1945–1946. On September 1, 1947, he became professor of civil engineering and dean of the School.

During the war, Professor Allan served as chairman of the department of applied mechanics of the Defense Training Institute of the Engineering Colleges of Greater New York. In addition, from 1941 until termination of the program in 1945, he was director of the Engineering, Science and Management War Training Program of the U.S. Office of Education at City College, in which some 13,000 persons were trained.

Professor Allan became associated with his co-author, Dr. Bakhmeteff, in 1933, while doing graduate work at Columbia University. He was an active participant in the Hydraulics Colloquium at Columbia and in seminars on fluid mechanics and applied hydraulics conducted by the New York City Board of Water Supply. He has served as engineering consultant on a number of hydraulics projects. In addition to the paper awarded the Norman Medal, Professor Allan is co-author with Dr. Bakhmeteff of "Energy Balance in Fluid Friction Patterns," presented at the Sixth International Congress of Applied Mechanics in Paris in 1946. He is author of a *Manual for Fluid Mechanics Laboratory*.

Joining the Society as a Junior in 1924, Professor Allan became an Associate Member in 1931 and a Member in 1946. At present he represents the Society on the board of the Engineering Societies Library. Other societies in which he has membership are Tau Beta Pi, Sigma Xi and the American Society for Engineering Education. He is secretary-treasurer of the Middle Atlantic Section of the latter organization.

THOMAS R. CAMP

THOMAS R. CAMP, recipient of the J. James R. Croes Medal, has done considerable research and development work in hydraulics and sanitary engineering, has written extensively in these fields, and is the holder of several patents. His writing has won for him two other Society prizes. In 1941 he was the recipient of the Karl Emil Hilgard Hydraulic Prize for a paper on "Lateral Spillway Channels," and in 1945 of the J. C. Stevens Award for his discussion of the paper, "Effect of Turbulence on Sedimentation."

A native of Texas, Mr. Camp was graduated from the Agricultural and Mechanical College of Texas in 1916. For the next seven years, except for a period of Army service during World War I, he was associated with the late John B. Hawley, M. ASCE, and other Texas engineers in municipal engineering work. From 1923 to 1925 he did postgraduate work at the Massachusetts Institute of Technology, receiving the master's degree in civil engineering in the latter year.

From 1925 to 1928 Mr. Camp was in municipal engineering practice in North Carolina under the firm name of Spoon, Lewis & Camp, and for the following year was principal design engineer for the late Alexander Potter, M. ASCE, in New York City. In 1929 he became associate professor of sanitary engineering at the Massachusetts Institute of Technology, where he remained until 1944.

For the past four years Mr. Camp has had a full-time consulting practice in the field of hydraulic and sanitary engineering with offices in Boston. In January 1947 he organized with his associates—Herman G. Dresser, M. ASCE, and Jack E. McKee, Assoc. M. ASCE—the consulting engineering firm of Camp, Dresser & McKee, of which he is senior partner.

Joining the ASCE in 1921 as a Junior, Mr. Camp became an Associate Member in 1923 and a Member in 1930.

ROBERT F. BLANKS

AUTHOR OF MANY technical papers and of special engineering reports for the U.S. Bureau of Reclamation is Robert F. Blanks, co-recipient of the Thomas Fitch Rowland Prize. Chief of the Research and Geology Division of the Bureau, Mr. Blanks early acquired an interest in research through part-time employment in the Kansas State Materials Testing Laboratory while working his way through Kansas State College, where he graduated in 1924, with the degree of bachelor of science in civil engineering. He received his C.E. degree from the same institution in 1936.

For several years prior to and following his graduation, Mr. Blanks held various administrative positions in Idaho public schools. Later he served with private irrigation companies in Idaho and on the hydraulic investigations of the American Falls Reservoir and Basin for the state of Idaho. In 1928 he was engaged on the Fort Hall Project of the U.S. Indian Service and in 1929 served the Army Corps of Engineers in its comprehensive investigations to determine the resources and possible development of the Columbia River Basin.

Since 1930 Mr. Blanks has been with the Bureau of Reclamation in Denver. His outstanding work there has been the development of the engineering and geological research laboratories from a comparatively minor operation to their present status, foremost among laboratories of the kind in the world. Mr. Blanks was first assigned to the office of the chief engineer of the Bureau on special studies of the Hoover Dam and power plant, and later was placed in charge of cement and concrete investigations for the dam. The investigations required the organization of two large laboratories, the training of personnel, and the standardization of new and unusual equipment, methods and procedures.

Upon completion of the Hoover Dam studies, Mr. Blanks was assigned to the complete field and laboratory investigation of concrete and concrete materials for all Bureau projects. Later reorganization consolidated all the engineering research laboratories of the Bureau under his direction. In addition to materials testing, the work of the laboratories includes general supplemental investigations for the solution of field construction and design problems; testing of hydraulic structures, machinery models, and structural and architectural models; and supervision of the field control and utilization of the various materials of construction.

A member of the ASCE since 1940, Mr. Blanks also belongs to the American Society for Testing Materials, the American Concrete Institute, Sigma Xi, and Sigma Tau. Active in international professional affairs, he has served on subcommittees of the World Power Conference and the International Commission on Large Dams.

HARMON S. MEISSNER

INVESTIGATION OF THE characteristics of concrete and the properties of cements has been the specialty of Harmon S. Meissner, co-winner of the Thomas Fitch Rowland Prize. Mr. Meissner graduated from the University of Utah in 1922 with the degree of B.S. in civil engineering. In 1929 he received the M.S. degree in civil engineering from George Washington University, after a period of evening study.

From 1922 to 1925 Mr. Meissner was with the Southern Pacific Railroad Co., engaged in the strengthening and repair of the Great Salt Lake trestle, and from 1925 to 1930 he was with the Bureau of Valuation of the Interstate Commerce Commission. In the latter position he assisted in the preparation of engineering reports on the cost of reproducing railroad properties, making inventories of their plants and evaluating their depreciation.

The desire to work on Hoover Dam led Mr. Meissner to transfer to the Bureau of Reclamation in 1930. In the chief engineer's office in Denver, he was em-

ployed on the preparation of plans and specifications for this structure, as well as for Madden Dam in the Canal Zone and Chief Elum Dam in the state of Washington. In particular, the design of reinforced concrete structures on these projects occupied his attention.

The unprecedented size of Hoover Dam and the accelerated construction program dictated new design and construction procedures requiring extensive research work. This work involved the development of cement of low heat of hydration, and determination of the thermal properties of mass concrete in order to control temperature rise and subsequent volume changes. In 1931 Mr. Meissner was placed in charge of the Bureau's newly created cement laboratory, which conducted research work on these problems. The paper, for which the Thomas Fitch Rowland Prize is given, discusses what Mr. Meissner considers one of the most pressing studies undertaken by the laboratories of the Bureau—the deleterious reaction between active aggregate and cement. At present Mr. Meissner is research engineer in charge of coordinating the research activities of the Bureau on concrete and cement.

Many of Mr. Meissner's technical writings have appeared in the *Journal of the American Concrete Institute*. He is chairman of Committee 609, Vibration of Concrete, of the Institute, and a member of Committee C-1, on cement, of the American Society for Testing Materials. He also holds membership in Sigma Xi and is an associate of the Highway Research Board. Joining the ASCE as an Associate Member in 1936, he has been a full member since 1944.

ROSS M. RIEGEL

THIS YEAR'S RECIPIENT of the James Laurie Prize is Ross M. Riegel, who has been prominently identified with the TVA since its inception. Mr. Riegel was educated at Cornell University, graduating in 1904 with the degree of civil engineer. Following his graduation, he was employed for several years in the fields of hydraulics and structures—principally as designer for the New York City Board of Water Supply and on the construction of hydroelectric plants in West Virginia.

In 1915 Mr. Riegel joined the staff of the Miami Conservancy District in Ohio, where after several promotions he became designing engineer for dams and appurtenant structures. During the period 1915 to 1926 he made model experiments for the District on the use of the hydraulic jump as a means of dissipating energy and, with S. M. Woodward, Hon. M. ASCE, prepared a report on the subject. During World War I, he was granted leave of absence to work with the U.S. Shipping Board.

From 1921 to 1926 Mr. Riegel served as hydraulic engineer for the West Penn Power Co., of Pittsburgh, engaged in exploration, design and construction on the Cheat River development in West Virginia. He was then appointed to the Pittsburgh Department of Public Works as departmental designing engineer on a large program of public improvements. The program included construction of new pumping stations and other waterworks improvements, several bridges and major street improvements. Upon completion of the work in 1931, Mr. Riegel served for two years as head of the Pittsburgh Bureau of Bridges.

In December 1933 he joined the TVA as the first man employed on its design staff. Later he became head civil engineer in the design department, which is his present position. In 1946 Mr. Riegel was sent to India by the State Department to advise the Indian government on the Damodar Valley Project.

He became a Junior in the Society in 1907, Associate Member in 1911 and Member in 1919.

FRANK L. EHASZ

FRANK L. EHASZ, winner of the Collingwood Prize for Juniors for his paper, "Structural Skew Plates," has been in private practice for the past two years as consultant to several architects and engineers on housing, hospital, commercial, industrial, and airport projects. Prior to this work, he was in the employ of consulting engineers and builders engaged in the design and construction of airports, parkways, viaducts, bridges and structures.

For a year following his graduation from New York University in 1933, with a B.S. in C.E. degree, Dr. Ehasz attended the University of Technical Sciences in Budapest, the recipient of a full fellowship in structural engineering sponsored by the Institute of International Education. He then studied for two years at Lehigh University on a research fellowship in civil engineering. The latter institution subsequently conferred upon him the degrees of M.S. in C.E., Ph.D., and C.E.

Dr. Ehasz was an instructor in civil engineering at Lehigh University for two years and held a similar position in theoretical and applied mechanics at the University of Illinois for three years. At present, in addition to the consulting practice that he maintains in New York City, he is lecturing in architectural construction at the Cooper Union for the Advancement of Science and Art.

Dr. Ehasz joined the ASCE as a Junior in 1933, and became an Associate Member in 1947. His other professional affiliations include membership in the American Concrete Institute, Iota Alpha, Sigma Xi, Pi Mu Epsilon, and Phi Eta. He was one of the founders of the Spartan Athletic Club of New York City, which he has served as president.

ALBERT L. GENTER

ALBERT L. GENTER, an authority on sludge elutriation and mechanical filtration, is recipient of the Rudolph Hering Medal. Mr. Genter was born in Breckenridge, Colo., received his early schooling in Salt Lake City, Utah, and his university training in Germany, graduating from the department of chemistry and metallurgy of the Royal Technical University of Berlin in 1904.

In 1905 Mr. Genter returned to Salt Lake City as structural draftsman in the ore-dressing field, and in 1906 in the same capacity he joined the newly organized General Engineering Co., operating under the direction of the late J. M. Callow. This connection led Mr. Genter into filtration engineering, and he was one of the founders of the Kelly Filter Press Co., which developed labor-saving filtration equipment for the industrial field. Inspired by the many technological uses of filtration and their place in the development of practically all branches of engineering, Mr. Genter found an early and lasting interest in this field.

In 1911 he returned to Europe as representative of his company, making Berlin his headquarters. He was successful in introducing the use of Kelly filters throughout the continent. The outbreak of World War I terminated this work in Europe, and Mr. Genter continued his activities in the United States and Canada. By 1918 he was developing his disk-type continuous filter for the United Filters Corp., successor to the Kelly interests.

From 1920 to 1927 Mr. Genter was again with J. M. Callow and his associates. In 1926 he went to Pittsburgh to work on the problem of the abatement of atmospheric and stream pollution by the steel industry. In particular, he worked on the clarification of water from the huge wet scrubbers that removed iron ore dust from blast furnace gases. As a result of this work, he became affiliated with the Bartlett Hayward Co., of Baltimore, engaged in the manufacture and installation of such scrubbers.

In 1931 Mr. Genter's interest in the relatively new field of dewatering digested sewage sludges in continuous suction filters was aroused by two authorities in sewage treatment—C. E. Keefer and the late John H. Gregory, Members ASCE. In 1932 Mr. Genter severed connection with the Bartlett Hayward Co. to devote

his time to private research in his new field of interest at the Back River sewage treatment works of Baltimore. He discovered and developed the elutriation process, which was first incorporated in the new sewage treatment plants designed by Metcalf & Eddy, Engineers, for the cities of Washington, D.C., and Hartford, Conn. Later Mr. Genter was employed in a consulting capacity in connection with sludge elutriation by Winnipeg, San Francisco, and several other cities.

A Member of the Society since 1941, Mr. Genter has contributed numerous papers to the ASCE PROCEEDINGS and to other technical publications. He is the inventor of several processes and processing devices in various engineering fields, in addition to the elutriation process. In 1944, as nominee of the Maryland-Delaware Water and Sewerage Association, Mr. Genter received the Kenneth Allen Award of the Federation of Sewage Works Associations.

A. A. KALINSKE

AUTHOR OF MORE than 50 technical papers on fluid mechanics and allied subjects, A. A. Kalinske is the recipient of the Karl Emil Hilgard Prize for his paper on "Conversion of Kinetic to Potential Energy in Flow Expansions." A graduate of the University of Wisconsin, class of 1933, Mr. Kalinske specialized in hydraulic and sanitary engineering. He then did graduate work at the university, receiving his M.S. in civil engineering in 1935. He was awarded a research fellowship as instructor in hydraulic and sanitary engineering at the university.

From 1936 to 1945 Mr. Kalinske was on the engineering staff of the University of Iowa, where he was active in the research work of the Iowa Institute of Hydraulic Research. He went through the various teaching grades, becoming associate professor of hydraulics and associate director of the Institute. Mr. Kalinske's work during this period was about equally divided between teaching and research in fluid mechanics. His research work dealt particularly with the application of fluid mechanics to problems of sanitary engineering, sediment movement in rivers, and flow in conduits. He did pioneer work in the field of fluid turbulence, and his prize-winning paper is the result of one phase of this work.

During the summers of 1941 and 1942, Mr. Kalinske was a special consultant for the Navy's David Taylor Model Basin in Washington, D.C. During the war, he supervised several research projects of the National Defense Research Committee at the Iowa Institute of Hydraulic Research.

In 1946, Mr. Kalinske became chief hydraulic engineer for Infilco, Inc., of Chicago, manufacturers of equipment used in water, sewage and waste treatment. His present work is primarily concerned with development and design problems dealing with the movement of various suspended solids in water and their separation therefrom.

An Associate Member of the ASCE since 1939, Mr. Kalinske also holds membership in the American Water Works Association, the American Geophysical Union, Tau Beta Pi, Chi Epsilon, and Sigma Xi. At present he is a deputy member of the Hydrology Panel of the Army and Navy Joint Research and Development Board.

MAURICE L. ALBERTSON

THE J. C. STEVENS AWARD goes to Maurice L. Albertson, associate professor of civil engineering at Colorado Agricultural and Mechanical College. Mr. Albertson graduated from Iowa State College in 1941, with the degree of B.S. in civil engineering, and received an M.S. in hydraulic engineering from the State University of Iowa in 1942.

Upon completion of his graduate work in 1942, Mr. Albertson became junior engineer in the Hydraulic Data Division of the Tennessee Valley Authority at Knoxville, Tenn., making hydrologic studies of the region. The next year he returned to the Iowa Institute of Hydraulic Research at the University of Iowa as research associate, later becoming research engineer. During this period with the Institute (1943 to 1947), Mr. Albertson did fundamental wind-tunnel research for the Office of Scientific Research and Development. He also served as an instructor in the department of mechanics and hydraulics of the university.

Research studies for the Navy, made during this period, included investigations of fog dispersal over airport runways and studies of the turbulence created by screens and baffles. At the close of the war, Mr. Albertson continued graduate study toward a Ph.D. in hydraulic engineering, writing his dissertation on the subject, "Evaporation and the Boundary Layer." It was Mr. Albertson's research during this period that led him to write his prize-winning discussion of the PROCEEDINGS paper, "Evaporation from a Free Water Surface."

Mr. Albertson joined the Colorado A. and M. College faculty in August 1947 as associate professor of civil engineering and associate civil and irrigation engineer for the Colorado Experiment Station at Fort Collins. His present research work includes a cooperative laboratory study of well screens and gravel envelopes in relation to the pumping of sand and eventual caving of the aquifer. Mr. Albertson is also in charge of a general investigation of the head loss and velocity distribution in various types of open and closed flow expansions.

A Junior in the Society since 1941, Mr. Albertson is also a member of the American Society for Engineering Education, the American Geophysical Union, the Kansas Academy of Science, the American Association of University Professors, and Sigma Xi.

Four Are Elevated to Honorary Membership

JOHN BOW CHALLIES

CONSERVATION AND USE of the water resources of Canada has been the dominant interest of John B. Challies during his long career as engineer and utilities executive. At present he is vice-president and executive engineer of the Shawinigan Water & Power Co., Montreal, Canada.

Mr. Challies graduated from the School of Practical Science of the University of Toronto in 1903. Five years later he received the C.E. degree from the same institution. From the time of his graduation until 1924, he occupied positions of increasing importance in the Dominion Government departments at Ottawa. He was successively chief hydraulic engineer in the Department of the Interior; superintendent of water power; director and chief engineer of the Water Power and Reclamation Service; founder and first director of the Dominion Hydrometric Survey; and member of the Dominion Power Board and the Dominion Fuel Board.

For many years Mr. Challies served as engineer adviser to the Department of External Affairs on international waterway matters, and was liaison officer for the department on the Research Council of Canada. He represented the Canadian government at the International Engineering Congress in San Francisco in 1915, and at the World Water Power Conference in London in 1924.

Since 1924, Mr. Challies has been with the Shawinigan Water & Power Co. which he has served as department manager in charge of water resources, assistant general manager, and vice president. During his connection with the Shawinigan Water & Power Co.

the largest private electric utility in the Dominion, Mr. Challies has been engaged in promoting the best use of water power on the many rivers in which the company is interested.

An authority on administrative, investigatory and international aspects of water resources and power, Mr. Challies received the honorary degree of doctor of engineering from the University of Toronto in 1938 "for achievement in the conservation and use of the water power resources of Canada." His articles in the water power field have appeared in technical publications in both the United States and Canada.

JOHN B. CHALLIES
New Honorary Member

Of particular importance has been Mr. Challies' work in obtaining more adequate recognition for the professional engineer in Canada. Largely through his efforts the Association of Professional Engineers, Province of Ontario, was formed. He was also one of the founders of the Professional Institute of Civil Service of Canada, in which he holds honorary membership. An early member of the Engineers' Council for Professional Development, he has aided that organization in the formulation of professional standards.

His leadership in all movements for advancing the prestige of the engineering profession and increasing its service to the public was recognized in 1938 by his election as president of the Engineering Institute of Canada. In 1947 Mr. Challies was awarded the Julian C. Smith Medal of the Institute for "achievement in the development of Canada." At present he represents the Institute on the executive committee of the Engineers' Council for Professional Development.

Mr. Challies has been a member of the ASCE for 33 years, having joined as an Associate Member in 1914. He has been a full member since 1920. Other American organizations in which he holds membership are the American Society of Mechanical Engineers and the American Institute of Electrical Engineers.

HARDY CROSS

WIDELY KNOWN AS an engineering educator and as the originator of new methods of structural engineering analysis, Hardy Cross is professor of civil engineering and chairman of the Civil Engineering Department at Yale University.

Valedictorian of his class at the age of 17, Professor Cross graduated from Hampden-Sydney College in 1902, with the B.A. degree. He received the B.S. degree from the same institution in 1903, the degree of B.S. in C.E. from Massachusetts Institute of Technology in 1908, and the M.C.E. degree from Harvard University in 1911. He is also the holder of honorary degrees from Hampden-Sydney College, Lehigh University, and Yale University.

Professor Cross gained his early teaching experience as instructor in English in his final year at Hampden-Sydney and as an instructor in English and mathematics at Norfolk Academy during the next three years. From 1908 to 1910, he was an engineer in the bridge department of the Missouri Pacific Railway. In 1912, following a year of graduate study at Harvard, he became assistant professor of civil engineering at Brown University, where he remained until 1918. After three years in general engineering practice, Professor Cross returned to teaching in 1921 as professor of structural engineering at the University of Illinois. He remained there until 1937, when he became professor of civil engineering and chairman of the civil engineering department at Yale University.

He has served as consultant on many engineering projects, including the correction of the settlement of the Charity Hospital in New Orleans, and was a member of the committee of engineers that prepared a report on the Tacoma Narrows Bridge failure. Professor Cross has made other contributions to the profession while serving on the National Committee on Suspension Bridges of the American Society for Engineering Education and on technical committees of the ASCE, the American Concrete Institute and the American Railway Engineering Association.

Professor Cross is, perhaps, best known as the originator of the moment-distribution method of computing stresses in rigid frames. Originally published in the PROCEEDINGS of the ASCE under the title, "Analysis of Continuous Frames by Distributing Fixed-End Moments," the method (known as "The Hardy Cross Method") is now widely used in design offices and the concepts on which it is based have been influential in many other fields. For this paper, Professor Cross was awarded the Society's Norman Medal in 1934.

His other publications include senior authorship, with N. D. Morgan, M. ASCE, of *Continuous Frames of Reinforced Concrete*, and authorship of numerous technical papers, principally on structural engineering subjects. His paper, entitled "Concerning the Importance of Teaching School," presented at a meeting of the American Society for Engineering Education in 1936, is widely known as an expression of his teaching theories.

HARDY CROSS
New Honorary Member

For his professional achievements, Professor Cross was awarded the Wason Medal of the American Concrete Institute in 1935 and the Lamme Medal of the American Society for Engineering Education in 1944. The latter organization cited him "for his development of revolutionary methods of analysis in structural engineering and for his application of these methods to the rigorous training of civil engineers. . ."

Joining the ASCE as an Associate Member in 1916, Professor Cross became a full member in 1922. His other affiliations include the American Concrete Institute, the American Railway Engineering Association, the Institute of Consulting Engineers, the American Academy of Arts and Sciences, the American Association for the Advancement of Science, and the American Society for Engineering Education. He is an honorary member of the Connecticut Society of Civil Engineers, a national honorary member of Chi Epsilon, a member of Sigma Xi, Tau Beta Pi, Sigma Tau, Omicron Delta Kappa, and Kappa Alpha.

WILLIAM H. McALPINE

A VETERAN IN THE service of the Army Corps of Engineers, William H. McAlpine has an outstanding record of achievement in the use and control of the rivers of the

nation. Since 1902, when he joined the Corps of Engineers, he has been prominent in its important navigation projects involving the canalization of rivers and, more recently, in its projects for flood control on inland rivers. At present he is Special Assistant in the Office of the Chief of Engineers, Washington, D.C.

WILLIAM H. McALPINE
New Honorary Member

Following his graduation from the Massachusetts Institute of Technology in 1896, Mr. McAlpine spent several years with the Massachusetts State Board of Health and the Metropolitan Water Board of Massachusetts. He then entered the employ of the U.S. Bureau of Navigation, and was assigned to duty aboard the *U.S.S. Ranger* marking and mapping the Bay of Panama and the coast of Lower California. Later he was stationed at the Navy Yard at Portsmouth, N.H.

From 1902 to 1912 Mr. McAlpine served the Corps of Engineers at Cincinnati, Ohio, and Frankfort, Ky., as resident engineer on the construction of Lock No. 10 on the Kentucky River and as engineer in charge of the operation and maintenance of all the navigation structures on that stream.

The years 1912 to 1930 were spent in Louisville, Ky., as principal engineering assistant to the District Engineer and, for the duration of World War I, as District Engineer. During this period, Mr. McAlpine was in direct charge of both design and construction features of the canalization of the Lower Ohio River for navigation. The project involved construction of eleven dams, including a unique structure at Louisville that utilized a steep natural fall in the river for development of hydroelectric power. The size of the river and unusual problems of fluctuation and scour made the project one of the most difficult undertaken by the government to date. Upon completion of the Ohio River project, Mr. McAlpine spent the next three years (1931 to 1934) in St. Louis, where he was in charge of the design and construction of locks and dams on the Upper Mississippi.

In 1934 Mr. McAlpine was called to the Office of the Chief of Engineers in Washington to aid the Corps of Engineers in the construction of flood control dams as part of the government's program of public works. Prior to that time, few such dams had been built in the United States, so Mr. McAlpine was called upon to do considerable pioneer work in various capacities in the Office of the Chief of Engineers. He was at first in charge of engineering, and later became Special Assistant to the Chief of Engineers, which position he now holds.

During Mr. McAlpine's tenure in the Office of the Chief of Engineers he has served on practically every board of consultants on every major dam planned or built by the Corps of Engineers—Fort Peck, Denison, Norfork, Tygart, Garrison, Clark Hill and McNary, to name a few. He has served on boards studying river and navigation developments on the Upper Mississippi, the Mississippi below New Orleans, the Missouri River, the Florida Canal and the St. Lawrence Waterway. At present he is a member of the Board of Consultants for the Tennessee Valley Authority, and of the Board of Consultants of the Panama Canal appointed by the Governor of the Panama Canal Zone in connection with new studies of the Canal authorized by the 79th Congress. Mr. McAlpine's wartime services with the Corps of Engineers won for him the Exceptional Civilian Service Award.

A Member of the Society since 1916, he has been a member and secretary of the ASCE Waterways Division and has contributed to the ASCE PROCEEDINGS. He is co-author of a paper on "Modern Types of Navigable Dams," which was presented at the 16th International Congress on Navigation. Mr. McAlpine is a member of the Society of American Military Engineers, and member and past-president of the Engineers and Architects Club of Louisville, Ky.

KARL TERZAGHI

AN AUTHORITY ON soil mechanics, Karl Terzaghi is eminent in both the teaching and consulting fields. At present he is professor of the practice of civil engineering in the Harvard University Graduate School of Engineering.

Born in Prague, Czechoslovakia, Dr. Terzaghi graduated from the Technische Hochschule at Graz, Austria, in 1904. From 1905 to 1914 he was employed in various capacities, chiefly as superintendent of construction on jobs in Austria, the Balkans, northern Russia, and the western part of the United States. He then served for two years in the air corps of the Austrian Army.

In 1916 Dr. Terzaghi became professor of civil engineering at the Imperial Engineering School at Istanbul, Turkey, remaining until 1918 when he accepted a similar position at Robert College (an American institution) in Istanbul. He was at Robert College until 1925, engaging in extensive experimental research on

KARL TERZAGHI
New Honorary Member

foundations, the results of which were published in 1925 in a book entitled *Erdbaumechanik*. From 1925 to 1929 he continued his teaching activities at the Massachusetts Institute of Technology, serving also during this period as a consultant on various dam, foundation and subway projects.

Dr. Terzaghi accepted a professorship at the Technische Hochschule in Vienna in 1929 and remained there until 1938. During these years he was a consultant on Swir III, a hydroelectric power development, in northern Russia; on irrigation projects in Central Asia and Transcaucasia; on the construction of rockfill dams in Algiers; and on numerous other projects in the Eastern hemisphere.

Harvard University invited Dr. Terzaghi to lecture on soil mechanics in 1936, the year of its tercentenary celebration. The First International Conference on Soil Mechanics met at Harvard in that year, and Dr. Terzaghi served as its president. Resigning his professorship in Vienna in 1938, he returned to the United States and was appointed lecturer in the Harvard Graduate School of Engineering.

From 1938 to 1941 Dr. Terzaghi acted as consultant on soil mechanics in connection with the building of the Chicago subway. In 1941 he was employed by the Dravo Corp., of Pittsburgh, on the construction of two drydocks at Newport News, Va. During the past few years he has served as consultant on numerous construction jobs in the United States, Mexico, Canada, and Sweden. Last

year he went to India as a member of a board of consultants for a large reclamation project, and of recent months he has been serving in a consulting capacity in Brazil. For the past year Dr. Terzaghi has filled one of the newly established chairs of professor of the practice of civil engineering in the Harvard Graduate School of Engineering, and he is also lecturer and research consultant in civil engineering at the University of Illinois.

Dr. Terzaghi is the author of *Theoretical Soil Mechanics* and co-author of books on soil mechanics and of a book on engineering geology. Contributor of numerous papers to the ASCE PROCEEDINGS, he was awarded the Norman Medal of the Society in 1930, 1943, and 1946.

His membership in the ASCE dates back to 1925 when he became an Associate Member. He has been a full member since 1927. Dr. Terzaghi's other technical affiliations include the Institution of Civil Engineers, which he served as James Forrest Lecturer for 1939, and the Boston Society of Civil Engineers. He has won the Desmond FitzGerald Medal and the Herschel Prize of the latter organization and the Frank P. Brown Medal of the Franklin Institute, Philadelphia.

"Transactions" Index Is Included in Society Bills

MEMBERS WHO HAVE standing orders for TRANSACTIONS received with their January bills a charge for both Volume 112 of TRANSACTIONS and for a separate volume, TRANSACTIONS INDEX, which covers all TRANSACTIONS papers for twelve years, Volumes 100 to 112, inclusive. Cost to be billed for the index was set by the Board at $1.00 for paper, $2.00 for cloth and $3.00 for morocco. The last index volume was issued in 1934 and covered the years 1921 to 1934, Volumes 84 to 99.

Members and others who do not have standing orders for TRANSACTIONS may desire the new index. It is a valuable addition to every scientific library, public or private, with or without the TRANSACTIONS volumes themselves.

Orders for separate volumes of TRANSACTIONS, Volume 112, or TRANSACTIONS INDEX, Volumes 100 to 112, will be filled as soon as the books are released by the printer. Members who do not have standing orders for TRANSACTIONS and who desire their names added to the 13,000 now on the standing-order list, can be so registered through letter request to the Executive Secretary. TRANSACTIONS are billed, per copy, at $2.00 for paper, $3.00 for cloth and $4.00 for morocco. When placing orders, members should state the type of cover desired—paper, cloth or morocco.

"Transactions" Serves as Nucleus for the Civil Engineer's Library

Volume 112 to Be Mailed in January

HAROLD T. LARSEN, M. ASCE
Editor of Technical Publications, ASCE

WHAT THE MEDICAL journal is to the doctor and the law review is to the legal counselor, the TRANSACTIONS of the Society is to the professional civil engineer.

The truly professional civil engineer, consciously or unconsciously, looks upon his work as a calling—a profession. His lifetime is given over to an objective practice, born in an ideal and nurtured in an atmosphere of enthusiasm. To such a man, the birth of a new idea for finding stresses in a suspended cable, or for dismantling and moving a stiff-leg derrick is cause for rejoicing similar to the saving of a lost soul in the buoyant heart of a clergyman.

A rare opportunity to test this case arose in the current year when the Society's finances required that members desiring TRANSACTIONS pay a relatively nominal sum for collating and binding it. When the orders for Volume 111 were in, it was found that more than half of the membership had elected to continue their reference sets.

Volume 112 is now on the presses and the first bound copies should be in the mail some time in January. It contains 40 papers, which with contributions of discussers account for a total of 234 writers. In addition, the memoir section contains 104 professional records of deceased members. Among the wide diversity of subjects, collated and carefully indexed, are: Design of hydraulic structures (cavitation, uplift of dams, ice thrust, groundwater, drawdown tests of wells, debris barriers, erosion, relief wells for dams and levees); the theory of structures (safety factors, service record of the Brooklyn Bridge, floor loads in buildings, aluminum girders, plywood I-beams, thermal action, matrix analysis); waterway problems (Mississippi River control, shipways, landslide correction); surveying (triangulation, aerial photography, photogrammetry); engineering economics (engineering costs and budgets); regional planning (location of industries); highway interests (express highways, speed of trucks on grades); and professional (engineering education and the President's address).

ASCE TRANSACTIONS can be made the core of the technical library of every civil engineer from Junior to Honorary Member. Current prices for TRANSACTIONS per volume are:

To ASCE members in all grades:

Paper bound	$2.00
Cloth bound	3.00
Half morocco	4.00

To other subscribers, if ordered at once:

Paper bound	$12.00
Cloth bound	13.00
Half morocco	14.00

The subscriber rates are for Volume 112; for older volumes the charge is $4.00 more except that, in all cases, libraries receive a discount of 50%.

Members who desire the new Volume 112 but do not have a standing order on file should place such order and advise Headquarters immediately and state the style of binding required.

Lima Meeting Recommends Pan American Convention

NEED FOR the organization of a Pan American Association of Engineering Societies with purposes and constitution similar to those of the Federation of South American Engineering Societies (USAI), as well as the possibility of convening a Pan American Engineering Congress were discussed at a recent conference of representatives of the USAI held in Lima, Peru. Engineers Joint Council's Committee on International Relations was represented at the meeting by James S. Thompson, New York, N.Y.

A motion, in accord with one adopted by the fifth convention of the USAI in Montevideo, Uruguay, in March 1947—passed for submission to the Board of Directors of USAI—reads as follows:

"That the participating delegates and official representatives here assembled, who are meeting in accordance with the action of the Board of Directors of USAI and on the initiative of the Argentine Executive Committee of that organization are unanimously agreed upon the desirability of the organization of a Pan American Association of Engineering Societies and believe that a convention for this purpose should take place in the city of Bogota during the year 1948, which convention would be called under the auspices of the Board of Directors of USAI."

The Lima conference agreed that the meeting of USAI, limited to South American engineering societies, which was planned for Rio de Janeiro in 1948, should be expanded into a Pan American Engineering Congress and held during the month of March 1949.

(Vol. p. 39)

Membership Grade Changes Favored, Answers to Questionnaire Indicate

ELIMINATE the present distinction between civil engineers qualified to be ASCE Members or Associate Members by designating them all as Members; discard the appellation Junior; designate present Juniors as Associate Members, with full corporate rights; create a new non-corporate grade of Student Member; and do not create a new senior corporate grade of Fellow or modify requirements for the grade of Affiliate.

In varying degrees, the foregoing are the answers of the ASCE membership to a questionnaire recently tabulated, with slightly more than 37 percent returns. Results of the returns have been turned over to the ASCE Committee on Membership Grades, of which D. G. Edwards is chairman and V. T. Boughton, H. L. Forshay, J. M. Kennedy and Director Albert Haertlein, are members. While the membership of the committee has changed at various times, the Committee on Membership Grades has been studying ways and means of simplifying membership grades since 1944 (see statement in CIVIL ENGINEERING for July 1947, page 64).

Answering the questions were 1,068 members 27 years old and under, and 7,199 who were older than 27. Juniors responding totaled 2,467; Associate Members, 3,400; Members or Honorary Members, 2,493; and Affiliates, 20

The question regarding amalgamation of the present grades of Member and Associate Member brought 5,500 "yes" votes and 2,726 opposed. There were 4,540 in favor of creating a new corporate grade of Associate Member with the same qualifications as now provided for Juniors, and 3,625 opposed this proposal. Change to some other appropriate title not carrying the word "Junior" was favored by 3,104 and retention of the appellation was favored by 2,449. Full corporate rights for those in the Junior grade were advocated by 4,491 and opposed by 3,211. If a new corporate grade is established, with the designation "Associate Member," those in that grade should have full corporate rights, declared 3,661, while 1,708 opposed the proposition. Creation of a new non-corporate grade for students was favored by 5,240 who advocated calling those in such new grade "Student Members," and by 1,366 who want to call them "Students," while 1,473 opposed such a new grade. There were 3,735 opposed to modification of the requirements for the grade of Affiliate, while 3,120 favored modification. Only 3,149 favored creation of a new senior corporate grade to be designated as "Fellow," while 4,771 opposed it.

Clearest indication of desire for some sort of change in membership grades was the vote on the general question: "Do you favor retention of all titles and qualifications as presently defined in the Constitution for the several grades of membership in the Society?"

Only 2,246 voted "yes," while 5,121 voted "no."

ECPD Pre-Engineering Tests Win Approval of Educators

PARTICIPATION of 40 colleges of engineering in the Measurement and Guidance Project of the Engineers' Council for Professional Development during the past year may result in the adoption of a standardized examination as an entrance requirement of American engineering schools. Commenting on this widely accepted project, Dr. A. B. Kinzel, chairman of the board of the Engineering Foundation, said: "It is increasingly important, in these days of unprecedented demand for trained engineers, that crowded institutions have a standard measurement for evaluating both the qualifications and accomplishment of students as a basis for improved selection and guidance."

As a part of the project, begun in 1943 by the ECPD in cooperation with the Carnegie Foundation for the Advancement of Teaching, 32,000 examinations were given throughout the nation during the past academic year. Of the 40 colleges participating in some way in the project, 39 gave the pre-engineering inventory to all members of the freshman class. A number of colleges which had given the inventory in past years requested that this series of examination be available in a national testing program conducted in advance of matriculation. National examinations were conducted in March, April and June of this year for 2,600 prospective college students. It is expected that in the future a large number of high school seniors will take this series of tests in the nationwide examination.

The pre-engineering examination serves as the official selection test of the Maritime Commission in its Merchant Marine Cadet Corps training program. In November 1946 and March 1947 a total of 1,148 prospective cadets were so tested. Likewise, 699 applicants for the George Westinghouse Scholarships to the Carnegie Institute of Technology were examined last March in the first nationwide testing program.

To evaluate the worth of pre-engineering examinations, the records of students in ten institutions were compared at the end of their freshman year with the results of their pre-engineering tests. Results substantiated the value of entrance examinations in predicting the students' degree of success in engineering training.

Tests developed in connection with the Measurement and Guidance Project of ECPD include the engineering science aptitude test, designed for use in the second year of high school; the pre-engineering inventory, which is particularly appropriate for the guidance of students who have completed their secondary education; a series of achievement tests for sophomore engineering students; and specialized examinations for graduates in the various branches of engineering.

Mining Engineer Wins 1947 Alfred Noble Prize

JOHN H. HOLLOMON, mining engineer and research associate for the General Electric Co., Schenectady, N.Y., has been awarded the Alfred Noble Prize for his paper, "The Mechanical Equation of State," which was published in *Metals Technology* of the American Institute of Mining and Metallurgical Engineers. The prize will be presented at an early meeting of the institute, of which Mr. Hollomon is a junior member.

J. H. Hollomon

Holder of the bachelor's and doctor's degrees from the Massachusetts Institute of Technology, Mr. Hollomon taught in the Harvard Graduate School of Engineering in 1941 and 1942, and served as chief of the physical metallurgy section of the Watertown (Mass.) Arsenal during the war. At present he is directing research in physical metallurgy for the General Electric Co. He is the author of numerous papers on metallurgy and physics, and co-author of a recently published book entitled *Ferrous Metallurgical Design*.

Established in 1929, the Alfred Noble Prize was made possible by a fund contributed by Mr. Noble, one-time President of the ASCE. The prize is awarded annually to a young member of one of the four Founder Societies or the Western Society of Engineers for a published technical paper of unusual merit.

Analysis of EJC Report, "The Engineering Profession in Transition"

Highlights of Report Presented Before Annual Meeting of Arizona Section

JOHN GIRAND, M. ASCE

Johannessen & Girand, Phoenix, Ariz.

For nearly a hundred years the four major groups of engineers—civil, chemical, electrical and mechanical—have gone their ways without much coordination. It has only been in the last few years that any real attempt has been made to unify the engineering profession. All these engineering groups are now coalescing around the Engineers' Joint Council, which is composed of representatives of five national engineering societies. (See "'The Engineering Profession in Transition,' Report on Economic Status Survey," by William N. Carey, ASCE Executive Secretary, in CIVIL ENGINEERING for August 1947, page 13.)

ENGINEERS JOINT COUNCIL has already achieved a number of outstanding accomplishments for the profession as a whole, such as the economic reports on the disarmament of Germany and the one here discussed, the 1946 Survey of the Engineering Profession. This survey was made in cooperation with the federal government and was based principally on a questionnaire mailed to every member of each of the professional societies. A total of 87,000 questionnaires were sent out to a non-duplicated list of professional engineers. The questionnaires covered such items as formal education, annual income, employment status, industrial field in which employed, and similar broad questions relating to the engineering profession. Of the 87,000 questionnaires sent out, more than 48,000 were returned complete, better than 53 percent, which in itself is a significant figure indicating that engineers are interested in a survey of the profession. This 53 percent return on the questionnaire is considerably higher than the percentage that voted on the Society's amendment to increase the dues, which shows that more engineers are interested in knowing about the engineering profession than in raising or not raising engineering society dues.

The data obtained from the questionnaires were punched on cards sorted by mechanical means by the U.S. Bureau of Labor Statistics in Washington, D.C. The report itself was compiled by Mr. Andrew Frazer, a consultant who has had wide experience in work of this type, having organized and administered the 1935 federal survey of the engineering profession and also two special reports on the economic status of members of the American Chemical Society. The complete report, entitled "The Engineering Profession in Transition," is available to members of the Society for $0.50 and consists of over one hundred pages of well-documented statistics. Anyone who is interested in details of the engineering profession with respect to salaries or employment opportunities might well study the report as a whole.

National census figures indicate that there are today about 300,000 people in the United States who classify themselves to the census taker as being in the engineering profession. Of these 300,000, about 90,000 have passed the qualificational requirements of the professional engineering societies. The Engineers' Joint Council report deals with only those 90,000 who have attained the professional recognition available to them through the medium of their technical societies. It is not known how many of the remainder in engineering might qualify if they so desired, as membership in a professional society is not a legal requirement. There are undoubtedly a number in the engineering profession, particularly in federal government engineering, who are not included in the survey.

Civil, electrical and mechanical engineers, each with about 25 percent of the total, constitute the bulk of the engineering profession. Chemical, mining, ceramic and others make up the small remainder. One surprising thing about the survey is what these men do. Thirty percent of them are in administrative positions and are not engineers in the popularly accepted concept of the word. They are department heads, managers, executive officers, and similar people who require a broad background of engineering knowledge in their jobs, and are not necessarily the highly developed technologists who can perform feats of mathematical legerdemain as represented by most of the papers published in ASCE's PROCEEDINGS.

The second largest group, 15 percent, are in design, and these men can be graded as true technical engineers. The third group, 12 percent, are in development and research. These three groups total more than half of all professional engineers, and these men hold jobs where the primary ability required is good judgment. More than half the members of the profession are in a position to make important decisions concerning policy and methods which are reflected in large expenditures of money. This significant fact immediately suggests the possibility of reexamining the engineering curriculum to include business administration at the expense of some purely technical subject.

What these men earn in the way of annual salaries is a much more complicated question than what they do. For one thing, the compilation of statistics as made by the committee, was based on statistical methods which give exact answers as far as basic data are concerned. The interpretation of these data in the form of a report involves some personal opinion. The report followed the general idea of establishing a median, being that figure where 50 percent of the number of people would be above and 50 percent below. This method of analysis includes the people who are receiving exceptionally low salaries in engineering in the order of $200 or $300 a year, that is, those who have failed in engineering, and also includes the men who are making $20,000 or more a year, who obviously are not engineers working strictly in engineering.

If the idea of the median is accepted, certain trends are immediately apparent. First, civil engineers are the lowest paid of all engineers, not by just a little, but by a wide margin. There seem to be two general reasons for this. First, civil engineers as a whole do not have the educational background of other engineers. The survey showed, for instance, that nearly 40 percent of the chemical engineers have masters' degrees as well as bachelors' degrees and 15 percent have doctors' degrees, while in civil engineering only 15 percent have masters' and less than 5 percent have doctors'. The greater earnings of men with better education was established even before this survey, and was reaffirmed by data gathered during the survey.

The second reason why civil engineers seem to be in the lower category is the large percentage that are employed by governmental agencies. In other branches of engineering only 20 percent are employed by governmental agencies, while in civil engineering almost half find their livelihood in working for governmental units. It has long been established, and this survey has reaffirmed the fact, that, in general, engineers in government service receive less than those in private enterprise.

The earning capacity of the average civil engineer increases in an almost direct

ratio with his years of experience, but the earning capacity of the individual varies over an extremely wide range. For instance, a man just entering the profession or with one year of experience can expect a salary range from $200 to $300 a month, while the man with 40 years of experience can expect a salary ranging from $2,400 to $20,000 per year. The average man with 15 years of experience has a median salary of slightly over $400 a month, but the range is from $300 to $700.

For the profession as a whole, young and old, the bulk falls within the range of $250 to $650 a month. In this group are 70 percent of the professional engineers and the group averages $427 a month. This group probably represents the department heads, college professors—the average man that we know in engineering.

Above this 70 percent block there is another definite cluster around the $700 to $800 a month bracket. Of ASCE members, 14 percent are in this group. They average $750 a month and are probably people such as state engineers, chief engineers of local industry and those in similar positions.

The third definite group is an upper crust of about 12 percent who average $12,000 a year. These men are all more administrators than they are technical engineers and it is problematical whether they should be included in a survey of engineering salaries or not. They are men who we might say have graduated from engineering.

At the upper end of the probability curve there are 2 percent who make $20,000 a year or more. It is doubtful if any of these receive their salaries from pure engineering.

Last, but not least, are the 2 percent of professional engineers who have failed in engineering and report annual yearly incomes of less than $300 to $400.

The total money spent on engineering might be of some interest. The average engineer referred to above reported a salary between $2,800 and $6,300 a year. The 25,000 of this group who returned the questionnaire earn a total of over 100 million dollars a year. Those representing this group constitute only a third of the total professional membership. Professional engineers receive, after deleting the upper crust, something over 300 million dollars a year for their services.

This EJC report not only presents information that makes interesting reading, but it also brings to light the glaring inequalities which prevail throughout the engineering profession. As one of the prime purposes of professional societies is to promote the welfare of the engineer, it then becomes a society duty to take this EJC report and carry out a constructive program for the betterment of the profession. Such a program might consist of these items:

1. The necessity for increased education is apparent. Information developed in the report, along these lines, should be presented to Student Chapters and stressed so that as many as possible would take up graduate work on their own initiative, to increase their later earning power, even though their particular school does not require a five-year course. Additional stress should be laid on the necessity of lengthening the curriculum to five years. A greater effort should be made to establish research scholarships and graduate assistance throughout all schools. The 2 percent of the engineers who earn more than $20,000 a year indicates a potential reservoir for graduate student assistance within the profession. A large number of engineers who are in administrative positions should indicate the need for college training in business administration and finance.

It also points out a glaring defect in our publications. Thirty percent of our members are in administrative positions while zero percent of our PROCEEDINGS is devoted to space on administrative problems. It seems probable that a paper on the management of an engineering office would meet with a great deal of sympathetic response.

2. The difference between engineers in governmental service and private employment should be met more aggressively. It is not enough to call in an outside field man to make a salary survey when a threat of salary cuts is made. The survey should be continuous and it is possible that mere publication of the fact that a certain engineering department or office is paying considerably less than prevailing rates would be sufficient to cause the department to increase its salaries or to cause its employees to understand and leave the department for better opportunities.

3. The wide range in earnings of individuals in specific jobs must be adjusted. The man who designs a bridge costing a million dollars and requiring a certain degree of technical ability should not receive $400 a month in one locality and $800 in another. The direct ratio between years of experience in the profession and earning capacity indicates that job classification should include the years of experience in the profession as well as the requirements of the job itself. For instance, among engineers with 30 years of experience there is a spread from $400 to $800 a month in salary rate between the lower 25 percent and the upper 25 percent.

The greatest and most important thing in the survey just made by the Engineers' Joint Council Committee is the fact that it *was made*. Here, for the first time, the national professional engineering organizations have joined together to examine their own shortcomings and, we hope, to correct them.

Value of Cooperation Between Engineers and Architects Emphasized by AIA President

COLLABORATIVE EFFORT between architects and engineers can solve many difficult postwar problems, Douglas William Orr, president of The American Institute of Architects, stated in his address before the recent joint meeting of ASCE's Northeastern Section and the Boston Chapter of the AIA. Mr. Orr's statement that "At the national level architects and engineers find themselves pillars of mutual support," was substantiated by reference to several instances in federal legislation in which joint effort on the part of engineers and architects has yielded results. "The needs of today and the plans for tomorrow," he said, "make it necessary that we strive to know each other better and cooperate in many spheres of activity at all levels."

He stated further that "during the lifetime of these two societies [AIA and ASCE] the whole fabric of our living has been changed. The terrific pace of advancement of the physical and biological sciences has changed the pattern from one of complete simplicity to a highly complex affair. But the specialization, the technical proficiency of which we boast has its dangers. It tends to lead to fossilization and over-emphasis on technology. We of the design professions may well ask ourselves—we have shaped the machine—should we allow the machine to shape us?"

Enlarging on this idea, Mr. Orr continued, "Perhaps one of the faults of all branches of the design professions is that our concern with technology has driven us from contact with man. In an age where the machine looks as though it has almost won the first round over man, the thinkers and forward-looking men of our time are concerned and they have reason to be. We in America have come through two soul-shaking conflicts to bide our time in an uneasy and grim postwar era where there is neither peace nor war. The atom, the smallest particle of matter, looms larger on the horizon than the most enormous battleship. As yet we have not

learned best to utilize the products of our swift advancement and certainly our material gains have brought us no contentment or peace of mind. I believe that to meet this dilemma we must change our sights and try to understand our basic underlying problems, not in terms of technology but in terms of human betterment.

"We members of the design professions must be just as concerned with the impact of our work on the lives of Mr. and Mrs. America as with matters of specifications and use of materials. We cannot forsake the responsibility that the structures which we design are used by men from birth to death, that the cities we alter or create are to serve for human use. Are they sufficient? The demands are enormous but the combined knowledge of the profession is also enormous.

"To get ready for 1960 it would be well for all members of the design professions to survey the fields in which they can be of mutual assistance. I see no reasonable basis on which to define and delimit the spheres of activity of architecture and the engineering sciences. But where all boundaries and artificial limiting points cease is in the field of public welfare, to which all of us should be dedicated. I would like to indicate common fields of activity, common to both architecture and engineering, where the design professions can at this moment render a great service to the nation.

"Today our American cities are in a mess—inadequately planned, overcrowded, dirty, heavily trafficked, and threatened with the perils of decentralization. Our automobiles are beautifully designed mechanisms but they bog down in critical fashion on roads and streets designed for horse-drawn carriages. Parking has become a headache.

"Another field of activity which requires immediate attention from all of us is the matter of 'stabilization'—for want of a better word—of building costs. Unless action is taken in the near future to provide greater efficiency of management and a more productive labor force we may have to admit that we have failed to solve some of America's most pressing problems, providing housing for example, at more moderate rates. Here again architects and engineers can join hands. At present the AIA is attempting to aid a Congressional committee which is investigating building costs. In an added attempt to aid, the AIA has appointed a Committee on Criteria and Standards for Houses, an undertaking we consider exceedingly important. Another AIA committee is trying to bring about a better understanding in the matter of building codes.

"One of the greatest challenges which we face is this matter of urban redevelopment which results historically from the unplanned, centuries-old growth of American cities and their clusters of equally unplanned suburbs. The Urban Redevelopment Committee of the AIA has suggested a three-point attack which will include a statement of the principles of redevelopment policy, a suggested emergency program and a long-range program. It is a cooperative venture in which all engineers and architects must be vitally concerned or they will be evading their responsibilities."

Having posed so many and serious problems, Mr. Orr nevertheless concluded on a hopeful note, again emphasizing the need for cooperation between engineers and architects. "We of the design professions must work together to prove that man is mightier than the machine. Such collaborative effort can master the most difficult tasks."

Engineering Library Has Busiest Year, Survey Shows

USE OF THE Engineering Societies Library in its fiscal year 1946–1947 was 5 percent greater than in the preceding year, according to the report of Ralph H. Phelps, former acting director who became director during the year. Especially significant is the fact that those using the Library by mail increased 9 percent, so that actually 40 percent of those who availed themselves of the Library's services did so without visiting it in person. In the past two years, total use of Library services has increased 20 percent.

All types of services rendered by the Library increased, with the sole exception of translations, which fell off 38 percent in volume of words translated. Photostat prints made increased 12 percent; microfilm orders, 33 percent; number of borrowers, 46 percent; number of books loaned, 48 percent; telephone inquiries, 10 percent; and letters written, exclusive of books orders, 28 percent. The number of searches remained the same.

According to Mr. Phelps' report, the outstanding feature of the year was the thorough study of the Library made by the Committee on Library Objectives and Development, E. F. Church, Jr., chairman. This study shows that since 1941 the cost of important items in the budget has increased from 50 to 65 percent, but in the same period Library income has increased only 18 percent. Severe curtailment of activities has been avoided only by using credit balances accumulated during the war years. The report is the most comprehensive ever made on the Engineering Societies Library.

As the search and translation services were operating at about a 20 percent loss under 1940 rates, the prices charged were raised as follows:

Searches	from $2.50 to $3.00 per hour
Translations:	
German, French, etc.	from $1.00 to $1.50 per 100 words
Russian, Swedish, etc.	from $1.20 to $2.00 per 100 words

Photostat and microfilm rates remain the same, as follows:

Photoprints	$0.30 each ($0.25 each if for a member's *personal* use)
Microfilm	$1.50 for any one article from a single volume of a periodical, regardless of length of article

As in the past the Library has received many valuable gifts of books and magazines. During the year 8,081 volumes, pamphlets, maps, etc., were received by gift and purchase, of which 5,095 were added to the Library. In addition, several thousand reports were received from the Office of Scientific Research and Development and the National Advisory Committee for Aeronautics. The total resources at the close of the fiscal year were 164,051 volumes, 10,316 maps, and 4,943 searches—a total of 179,310 items.

Texas Section Honors Retiring Secretary Focht

PROF. JOHN C. FOCHT, who is retiring as secretary-treasurer of the Texas Section after ten years of service in the post, was honored by the Section at its recent fall meeting. The Section passed a resolution referring to Professor Focht's ex officio duties in "editing and publishing *The Texas Engineer*, executing the orders of the Board of Directors, handling all matters involving finances, and being 'liaison agent without portfolio' between the Texas Section and the Society."

As a more tangible expression of its appreciation, the Section presented Professor Focht with a 16-mm moving picture camera, film, projector, and screen.

Lower Costs Through Greater Productivity Stressed by Construction Group

INCREASED PRODUCTIVITY was stressed as one of the important aids for bettering the construction industry at the November 19–20, 1947, meeting of the Construction Industry Advisory Council in Washington, D. C. Chairman of the Council since its organization two years ago, J. C. Stevens of Portland, Ore., Past-President ASCE, was succeeded in this office by James D. Edmunds, Jr., Past-President AIA, elected at the meeting.

Resolutions passed under the heads of Productivity, Industry Engineered Modular House, Stability, Bidding, Research, Building and Other Codes, Apprenticeship and Training, and Veterans' Housing read as follows:

Productivity

"Productivity in construction, as in other fields, depends upon many factors, including the seasonal and intermittent character of important areas of construction activity, the design of structures, the scheduling and supervision of work, the flow of materials to job site, and the skill and morale of the workers. Both management and labor have an important, direct interest in widening the market for the services of the construction industry by increasing productivity. They should study and explore practical ways and means of increasing production. Such efforts will serve the public interest in an important way by helping to lower costs and to provide for more continuous employment for construction and building trades workers.

Industry Engineered or Modular House

"All branches of the building industry should give encouragement to the industry engineered or modular house program, the purpose of which is to reduce the cost of building homes by bringing to the individual owner and the builder the economic benefits of better coordination of the design of structures, the manufacturing of their materials and equipment, and their assembly on the site. The principles underlying these objectives may be applied by any producer, dealer, designer or builder.

Stability

"Maintenance of a shelf of planned projects capable of being awarded when economic conditions call for such action is recognized to be a promising method of stabilizing construction activity. The Advisory Council recommends adherence to this principle by both private industry and governmental agencies and its effectuation as far as public works is concerned by renewal of the program of federal loans for the advance planning of local public works.

Bidding

"It is in the interest of both public and private buyers of construction that the normal practices of firm negotiations be resumed: firm quotations, firm delivery commitments, and firm orders.

Research

"The Construction Industry Advisory Council is greatly encouraged by the establishment, in the National Research Council of the National Academy of Sciences, of the Building Research Advisory Board under the chairmanship of Dr. Frank B. Jewett. It pledges its full cooperation and support to the activites of this Board which are designed to stimulate technical research and to provide an authoritative clearing house of technical information in the building field. It will carry out this pledge through the Research Activities Committee recently appointed by its chairman to serve as the formal liaison with the Building Research Advisory Board and to take responsibility for providing the necessary underwriting of this important undertaking.

Building and Other Codes

"The construction industry should extend its assistance to modernize building and other codes and to support their sound administration. The only objectives must be to protect the public life, health and property. At the same time there should be permitted the exercise of individual initiative in improving the design, the materials, the equipment, and the methods of assembly into building and other construction. It is important that legal and other obstacles in the way of the use of communities and states, in their codes, of recognized standards or requirements developed through acceptable industry processes and by qualified agencies be overcome, and that means be devised for keeping code requirements in step with the advance of the arts. There is need, also, for greater standardization and coordination of testing methods so that a determination once made of the acceptability of a new material or method of assembly will be more widely used.

Apprenticeship and Training

"While over one hundred thousand young men are being trained as skilled workers in the construction trades, the labor supply is not keeping abreast of requirements, either to meet urgent present demands or for the active years ahead. The development of new methods to shorten the training period and make the apprentice more useful when he goes on the job is, in a number of instances encouraging evidence of cooperation on the part of contractors and labor organizations, but such cooperative actions are far too few. The large volume of construction activity in prospect and the high average age of skilled journeymen make it imperative that industry programs and governmental support for apprenticeship and other training, including refresher courses, be further accelerated and greatly intensified.

Veterans' Housing

"The Construction Industry Advisory Council reiterates its expressed conviction that chambers of commerce, trade associations, and professional organizations throughout the country should encourage community action to assist veterans to obtain needed housing, including rental accommodations."

ASCE Executive Secretary William N. Carey and ASCE Eastern Representative E. L. Chandler attended the Council meeting and, as members on a resolutions committee headed by Robert W. McChesney of Washington, D.C., assisted in developing the resolutions quoted.

Daniel W. Mead Student Prize Goes to Veteran

L. G. LAMON, Marine Corps veteran and member of the University of California Student Chapter, is recipient of the first postwar award of the Daniel W. Mead Student Prize. Presentation of the award was made at the December 16 meeting of the San Francisco Section at which Mr. Lamon read his prize-winning paper, "The Desirability of a Code or Canons of Ethics for Engineers."

L. G. Lamon

Mr. Lamon graduated from Yuba Junior College in 1940 and entered the University of California, leaving in 1942 to enlist in the Marine Corps. He served as master technical sergeant in a Marine Bombing Squadron for more than three years, and was in the South Pacific for a year and a half. Reentering the University of California in February 1946, upon his discharge from the service, Mr. Lamon graduated in June 1947 with the degree of B.S. in engineering.

Established in 1939 by Daniel W. Mead, Past-President and Honorary Member of the Society, the prize consists of a certificate and cash award of $25. Deferred during the war, award of the prize was reactivated by the ASCE Board of Direction at its 1946 Spring Meeting.

Engineering Institute of Canada Sponsors ECPD Meeting in Montreal

Fifteenth Annual Meeting Plans Expanded Accrediting and Training Program

PLANS FOR A BIG YEAR of training and accrediting were formulated at the annual meeting of the Engineers Council for Professional Development held in Montreal, Canada. As host to the meeting, the Engineering Institute of Canada provided facilities in the spacious Mount Royal Hotel, where the sessions of ECPD and its committees were held during the two days of October 24 and 25.

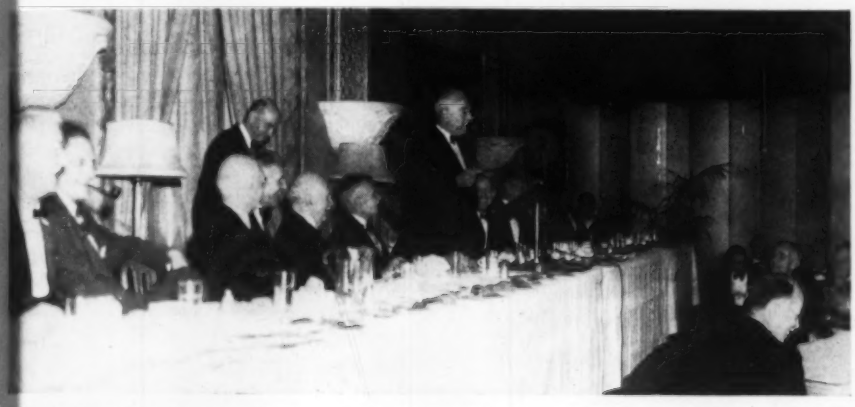
Accrediting Program Announced

Resumption of the accrediting of college curricula was announced by D. B. Prentice, chairman of the Committee on Engineering Schools. Reorganization of the regional inspection committees has begun and inspections will start immediately. It is planned to examine all accredited colleges within the next three years. Other colleges requesting examination will be given special consideration.

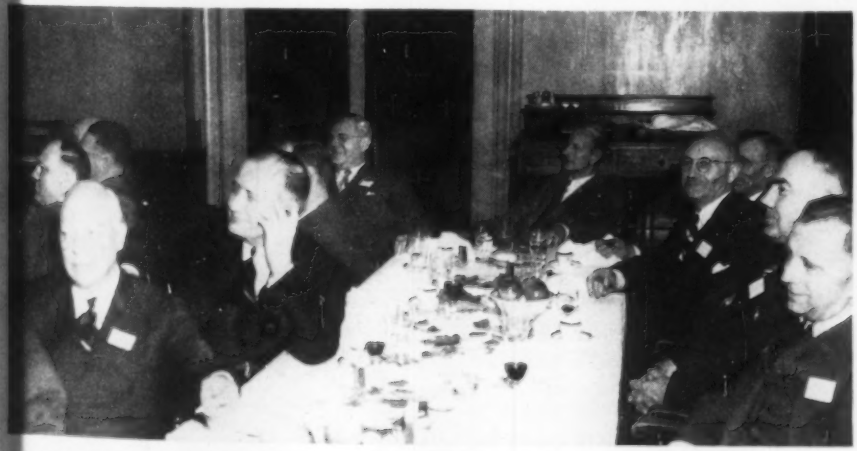
A new subcommittee on graduate instruction has been organized with plans to accredit graduate curricula. Another subcommittee has continued the program of accrediting specialized courses in technical institutes. Dr. Prentice also reported the formation of a special committee to investigate and advise on means of officially reorganizing the curricula and degrees of colleges in Central and South America. This step has been taken to cooperate with the Latin American colleges that have been seeking such recognition.

At the Montreal meeting H. T. Heald, M. ASCE, president of Illinois Institute of Technology, was appointed chairman of the Committee on Engineering Schools.

DUGALD C. JACKSON, M. ASCE, professor emeritus, Massachusetts Institute of Technology, and internationally known educator, addresses session of ECPD in Montreal.



ACKNOWLEDGING RECEIPT of certificate of special recognition presented by EIC, J. P. H. Perry, past Director of ASCE and former chairman of ECPD, addresses ECPD banquet at Mount Royal Hotel, Montreal.



DELEGATES TO ECPD annual meeting get together at Montreal's University Club as guests of Engineering Institute of Canada. Seated around table, left to right, are: A. B. Newman, president, AIChE; N. S. Hibschman, dean of engineering, Pratt Institute; C. L. Davies, executive secretary, ASME; L. A. Wright, general secretary, EIC; Ole Singstad, past Director, ASCE, New York consulting engineer; J. A. Vance, M. ASCE, engineer of Woodstock, Ontario; and W. P. Kimball, Assoc. M. ASCE, professor of civil engineering, Dartmouth College.

ASCE Cooperation Reported

The three representatives of ASCE on the Council, S. C. Hollister, Scott B. Lilly and Van Tuyl Boughton, reported on the past year's activities of ASCE that have resulted from the coordinating efforts of ECPD. Among these is the study of membership grades now under way, which is looking toward establishing a relationship between the membership grades of all professional engineering societies. Also reported was the constitutional amendment giving ASCE Juniors greater recognition including the right to vote. The new ASCE representative to the Council, Director Albert Haertlein, of Harvard University, was also present.

Officers for 1948 Elected

To guide the efforts of ECPD during the coming year, a slate of officers was elected at Montreal. James W. Parker, president and general manager of the Detroit Edison Co., was reelected chairman, and Harry S. Rogers, M. ASCE, president of Brooklyn Polytechnic Institute, was elected vice-chairman. A. B. Parsons, secretary of the American Institute of Mining and Metallurgical Engineers, was elected secretary, and S. L. Tyler, secretary of the American Institute of Chemical Engineers, assistant secretary. Scott B. Lilly, M. ASCE, chairman of the Division of Engineering at Swarthmore College, was appointed by the Council to head the Committee on Professional Training. Likewise Ole Singstad, past Director of ASCE, consulting engineer of New York, was appointed chairman of the Committee on Professional Recognition.

Licensing Needs a "Plus"

Dean Young Warns on Limiting Interpretation of a Professional License

"FAR TOO MANY young men have come to assume that the only thing lying between them and full professional stature is the obtaining of the legal right to practice. Nothing could be more illusory!" warned Dean C. R. Young, M. ASCE, in a recent address. Speaking before the Annual Meeting of ECPD in Montreal, the Dean of the University of Toronto's Engineering College urged the adoption of a new outlook by both young engineers and professional societies if anything resembling "professional status" is to be attained.

Pointing out marked benefits of the licensing movement to the public, Dean Young asked that attention be given lest a license become an end in itself rather than the protection to the public it was intended to be. He explained, "There is no assurance whatever that one so equipped will necessarily be accepted by a discerning and critical public as a person fully entitled to the esteem and deference that by common consent are accorded the members of the older and so-called learned professions. One illiterate or boorish license-holder may offset in the public mind the merits of a score of others about whom there can be no question. The whole profession is compromised by the unacceptable few.

Two Screens Needed

"Not enough weight has been given to general education by either the professional schools of engineering or the licensing associations. Two screens in tandem should be placed in the educational and training stream. The first would function as a selective device to ensure, in so far as may be possible, that those who enter the professional schools have those humanistic and cultural interests and capacities that must be inherent in one who hopes to be accepted as a member of a true profession. The second should be introduced by the licensing bodies in scanning applications for registration as a check on the effectiveness of the first as an instrument of selection of personnel for educational and professional training and as a corrective if it has failed.

"On their part, the licensing bodies should place increasing emphasis on the general educational attainments of those who seek registration. There are still substantial numbers of applicants who base their claims almost wholly on technical knowledge and competency and but little on acquaintance with those things that characterize a broadly educated man. As a result of undue emphasis on the importance of excellence in mathematics and science some men of circumscribed outlook have unfortunately slipped through the universities with small evidences of ability to express themselves clearly or correctly in their own language. The proposed second barrier against illiteracy in professional circles could be introduced by the licensing associations through requiring in respect of the graduates of the professional schools a minimum standing in non-technical subjects and through a corresponding test of those who seek registration through examination.

Learners Should Not Be Leaners

"It is unfortunate that some young men look to the professional associations to do for them what only they can do for themselves. Attainment of that degree of public regard that in effect accords to the one that prompts it a vital place in the community wherein he labors derives from the personal merits of the man himself and not from the bulk or the forcefulness of any organization to which he belongs. One cannot be securely legislated into high places. Professional organizations have a value that is largely limited by technological and economic considerations. They cannot give that quality of understanding, that sympathetic man-to-man relationship that determines ultimate acceptability.

Some Suggested Measures

"While unstimulated awareness of the superior advantages of the well-educated man as contrasted with one of narrow outlook may bring eventual but slow remedy, educational institutions and professional organizations cannot allow the matter to rest there. Positive and definite action needs to be taken.

"On their part the professional schools of engineering should revise upward their standards of admission, at least in so far as general educational subjects are concerned. For example, a bare pass or credit in English ought not to be accepted. A man who is so deficient in the use of his mother tongue as to be wrong as often as he is right in the use or appreciation of the spoken or written word is a sorry prospect for professional eminence. He may be a clever deviser of mechanisms, and an accurate predictor of what they will do, but completely ineffective as a member of a society that depends for its progress on the cooperation of educated men dealing with situations on which their personal specialities have little bearing.

"The professional associations, or licensing bodies, have likewise an opportunity for significant and constructive action. Let them scrutinize with particular care the general educational qualifications of every applicant for admission, whether he comes by way of a university or directly from the shop, office, or field. Examinations for those who are not university graduates might very appropriately include a paper in English."

D.C. Section Committee Formed to Cooperate with Technical Divisions

TO UTILIZE more fully the technical knowledge of its members, the District of Columbia Section of ASCE has organized a Committee on Cooperation with Technical Divisions, as reported in the May 1947 issue of CIVIL ENGINEERING. The committee is to provide the vehicle by which local technical committees will coordinate their own activities and maintain liaison between the committees and the parent Technical Divisions. A membership survey just completed will facilitate the formulation of the local technical committees.

All Section members were invited to express first, second, and third choices as to their interest in the work of the 13 Technical Divisions of the Society. The membership preferences, summarized in Table I, show the possibilities for the stimulation of greater participation in the Society's technical operations. Wide interest was shown, as indicated by receipt of 302 returns from the 450 dues-paying members. One card came from far-away Persia. This possible line of activity aroused the particular interest of Juniors, desirous of extending their participation in the Section. In the variety and breadth of the interests expressed, the D.C. Section may be unique among Local Sections.

Analysis of the distribution of the returns shows a predominance of interest in construction and structural engineering with respect to the first-choice expressions. While to some such an emphasis in the nation's capital may be surprising, it is of course explained by the presence in Washington of a local construction industry, supplemented by several federal agencies interested in the planning, designing, and building of public works. Other clearly defined fields of civil engineering follow, in this order: surveying and mapping, highway engineering, sanitary engineering, and hydraulics.

Examination of the over-all results as those obtained by lumping first, second

and third choices, shows a different pattern. Construction again heads the list. Next, however, comes engineering economics, which cuts across the major fields. Hydraulics and highway engineering follow in that order.

Objectives to be served by the committee include:

1. **Encouragement of Technical Writing.** Interested individuals will have a channel for submitting papers and discussion to the Society. The local technical committee will also afford a means of securing systematic review of articles in a particular field, and of making assignments to competent persons for needed papers or discussion.

2. **Liaison with Technical Divisions.** This arrangement will aid in keeping the Section better informed as to the work of the Technical Division and will also, importantly, provide a means for the expression of local views on the publication of selected articles.

3. **Appraisal of Research Proposals.** Suggestions for needed research received by the Research Committee are referred to the Committee on Cooperation with Technical Divisions for technical review as to the pertinency of the subject matter, the form of presentation and the scope and promise of the proposed research.

The organization of the Committee on Cooperation with Technical Divisions, including the technical interest of each member, is as follows: E. Robert de Luccia (chairman), Power; R. C. Price (secretary), Engineering Economics; Frank H. Cosgrove, Air Transport; Jacob L. Crane, City Planning; Thomas R. Edmonston, Construction; W. N. Carey, Jr., Highways; Joseph B. Wells, Hydraulics; William E. Corfitzen, Irrigation; Harry B. Shaw, Sanitary Engineering; Thomas A. Middlebrooks, Soil Mechanics; Bernard F. Locraft, Structural; Harry W. Hemple, Surveying and Mapping; and Eugene W. Weber, Waterways.

This sort of Society activity offers ample opportunity for encouraging participation in the technical activities of the Society. During its brief history, the committee has received enthusiastic support. Other Local Sections may find it practicable to adapt to their own situations an activity of this kind. It opens the way for members in increasing numbers to contribute to and to benefit from technical functions of the Society. That makes an important contribution to one of the fundamental purposes of the American Society of Civil Engineers.

TABLE I. PREFERENCES OF MEMBERSHIP WITH RESPECT TO TECHNICAL INTERESTS

Division	Number Expressing Interest as First choice	Second choice	Third choice	Total	Percentage of First choice expressions	Total expressions
Air Transport	9	11	13	33	3	4
City Planning	18	38	23	79	6	9
Construction	42	42	30	114	14	14
Engr. Economics	22	27	39	88	7	11
Highways	32	22	26	80	11	10
Hydraulics	27	40	17	84	9	10
Irrigation	10	11	17	38	3	5
Power	21	7	9	37	7	5
Sanitary Engineering	28	5	11	44	9	5
Structural	40	25	8	73	13	9
Soil Mechanics	5	20	11	36	2	4
Surveying & Mapping	34	11	10	55	11	7
Waterways	14	17	24	55	5	7
Total	302	276	238	816	100	100

Publication of "Adelantos" to Be Continued in 1948

With the authorization of EJC, plans have been formulated to continue publication of *Adelantos de Ingenieria*, engineering quarterly for Latin Americans, on a self-supporting basis. Funds required to publish the quarterly during the coming year will be sought from manufacturers and commercial firms with foreign interests. Plans call for placing the publication on a self-sustaining basis, starting with the first issue in 1949, by soliciting advertising.

Editorial responsibility for the publication will continue to be in the hands of the Editorial Committee of the Commission on Latin America, operating under the EJC Committee on International Relations. Lloyd J. Hughlett is chairman of the editorial committee, which consists of editors from the Founder Societies and the AIChE.

First issued in 1947 as a cooperative project of the National Research Council, the Inter-American Development Commission of the State Department, and EJC, through its Commission on Latin America, *Adelantos de Ingenieria* has been enthusiastically received by South American engineers. Dean S. S. Steinberg, M. ASCE, of the University of Maryland, is chairman of the EJC Commission on Latin America.

NEWS OF LOCAL SECTIONS

Scheduled ASCE Meetings

ANNUAL MEETING

New York, N.Y., January 21–23
(Board of Direction meets January 19–20)

SPRING MEETING

Pittsburgh, Pa., April 7–9
(Board of Direction meets April 5–6)

Coming Events

Connecticut—Dinner meeting in New Haven, January 28, at 6:30 p.m. Speaker Carlton S. Proctor, newly elected ASCE Vice-President and New York City consultant.

Louisiana—Business meeting at St. Charles Hotel, New Orleans, January 8, at 3:45 p.m.; technical meeting with Society of American Military Engineers at St. Charles Hotel, January 10, at 10 a.m. (in connection with annual meeting of La. Eng. Soc.); annual meeting at New Orleans Athletic Club, January 24, at 8 p.m.

Maryland—Meeting at the Engineers Club, Baltimore, January 14, at 8 p.m. Cocktails at 6, and dinner at 7.

Metropolitan—No meeting in January.

Northwestern—Dinner meeting at Coffman Memorial Union, University of Minnesota, January 5, at 6:30 p.m. Speaker Kerwin L. Mick, chief engineer of the Minneapolis–St. Paul Sanitary District.

Philadelphia—Meeting at the Engineers Club, January 13, at 7:30 p.m. Dinner at 6:30 p.m. Speaker Harrison F. Gonnerman, director of research, Portland Cement Association, Chicago.

San Diego—Ladies' Night at the Tops Restaurant, San Diego, January 27, at 7 p.m.

Sacramento—Meetings at the Elks Club every Tuesday at noon. No meetings on holidays; special meetings as announced in the "Engineerogram."

South Carolina—Annual winter meeting at the Hotel Columbia, Columbia, S.C., January 30, at 10 a.m. Two technical sessions, luncheon, business meeting, and banquet.

Virginia—Annual meeting at the Hotel Jefferson, Richmond, January 30. Afternoon and dinner sessions.

Recent Activities

ALABAMA

ATOMIC ENERGY AND its implications were discussed by Dr. Fred Allison, head of the department of physics, Alabama Polytechnic Institute, at the annual fall meeting in Montgomery. Dr. Allison is credited with discovery of the elements 87 and 85 and of important isotopes, essential to the development of nuclear energy. Other speakers at the two-day session included Ward W. McFarland, state highway director; Melvin R. Williams, district engineer, U.S. Geological Survey, Montgomery; L. M. Smith, vice-president and director of public relations, Alabama Power Co., Birmingham; Robert N. Clark, chief public health engineer, TVA, Chattanooga, Tenn.; Walter B. Jones, state geologist, University, Ala.; Carl B. Fritsche, vice-president, Reichold Chemicals, Inc., Tuscaloosa; and L. A. Woodman, instructor in surveying, University of Alabama. Charles B. Dobbins, editor and publisher of the *Montgomery Examiner*, was the principal speaker at the annual dinner meeting. New officers for the Section, elected during the annual business meeting, are: Walter Scheilke, president; James M. Faircloth, first vice-president; Arthur N. Beck, second vice-president; and Graham P. Willoughby, secretary-treasurer.

ARIZONA

RESOLUTIONS SEEKING TO improve the financial condition of civil engineers were unanimously endorsed by members attending the two-day fall meeting in Phoenix. Citing the EJC report that shows civil engineers to be the lowest paid of all branches of the profession, the Section gave its board of directors a mandate to institute a definite Section program on problems of economic welfare before the spring meeting. The work of testing Army Engineer equipment, especially floating and fixed bridges on the Colorado River, was discussed during the technical session by Goerge W. Howard and John W. Giliberto, of the Yuma Test Branch Laboratory of the Corps of Engineers. Other speakers were W. S. Gookin, of the U.S. Bureau of Reclamation, who described the plan and development of the Central Arizona Project; W. L. Heckler, Contact Member for the University of Arizona Student Chapter, who discussed Local Section responsibility to Student Chapters; and John Girand, Phoenix consultant who discussed the EJC report, "The Engineering Profession in Transition." (See page 53.) A joint luncheon, with the American Association of Engineers, was addressed by W. C. Lefebvre, state highway engineer, who outlined the highway requirements of the state and stressed the importance of sound planning. During the annual business meeting, G. L. McLaine was elected president for the coming year, and George W. Howard, vice-president. V. E. Larson will continue as secretary-treasurer.

CENTRAL ILLINOIS

A JUNIOR BRANCH of the Section has been organized at Urbana, through the efforts of Professors N. M. Newmark and R. B. Peck, of the University of Illinois, and the Juniors of the Section. Most of the 90 Juniors in the new Branch are connected with the university, either as students in the graduate school or as members of the staff. A recent organizational meeting was addressed by George Salter, ASCE Mid-Western Representative, and F. J. Fudge, secretary of the Junior Branch of the Illinois Section. Mr. Fudge discussed the organization and functioning of the Illinois Junior Branch, which has its headquarters in Chicago. Officers of the Central Illinois Junior Branch are: W. M. Munse, president; M. L. Jackson, vice-president; and Clyde Kesler, secretary-treasurer.

CENTRAL OHIO

INSPECTION OF Delaware Dam, and talks by the Army Engineers who are in charge of construction of the project, featured a joint meeting of the Section and the Franklin County Chapter of Professional Engineers. The design, construction, and operation of the dam were described at the dinner meeting following the inspection trip, by Col. Alexander Neilson, district engineer of the Huntington District of the Army Engineer Office, and Harry Pockras, principal engineer. The dam, which is of the gravity earth-fill type of construction with a concrete spillway section, serves a drainage area of 381 sq miles and has a storage capacity of 132,000 acre-ft. Speaker of the evening at a joint meeting with the Columbus Technical Council was Charles A. Scarlott, manager of publications for the Westinghouse Co. Discussing the subject, "Engineering for Tomorrow," Mr. Scarlott described such inventions as X-ray movies with the aid of radar and a gyroscope for railroad cars to eliminate bumping and jolting.

CINCINNATI

A PANEL OF Juniors in the Section presented the technical program at a recent meeting. These were Harry Graham, who described the unique "coyote hole" method used in quarrying operations at Nantahala Dam; Chester Swanson, who explained the use of pumpcrete machines for pouring structural concrete; W. G. Hamlin, who discussed postwar Japan under the American Military Government; and George Kral, who spoke on key considerations in the design of aircraft structures.

CLEVELAND

THE IMPORTANCE OF Junior activities was stressed by ASCE Mid-Western Representative George S. Salter at a recent meeting. Speaking on the aims and activities of the ASCE, Mr. Salter pointed out that the growth of an organization like the Society is inseparably linked to Junior interest and participation in its affairs. At the same meeting Wendell R. LaDue, president of the American Water Works Association, spoke on water supply as a business. The principal speaker at another recent meeting was P. W. Johnston, vice-president of the Erie Railroad Co., who discussed the role of transportation in the future of the country.

COLORADO

THIS YEAR'S OUTPUT of steel will exceed that of all other years in the nation's history, John D. Griffiths, engineer for the American Institute of Steel Construction, Omaha, Nebr., told members of the Section. Addressing the annual meeting on December 8, Mr. Griffiths reviewed the role of steel in our peacetime activities and showed a sound film depicting the various stages of manufacture, from the iron mine to the structural shapes used by the engineer. During the annual business meeting, the following officers were elected for 1948: Alfred J. Ryan, president; Carl A. Gould, vice-president; and John S. Marshall, secretary-treasurer. The federal airport program was discussed at another recent meeting by R. D. MacDonald, district airport engineer for the Civil Aeronautics Administration.

DAYTON

GREAT PROGRESS HAS been made in the development of plastic materials since the war, according to George Ham, research engineer for the Monsanto Chemical Co., who addressed a recent meeting. Dr. Ham displayed many articles made of plastics which will be on the market shortly, and discussed recent developments in the field in their application to industry and commercial products.

DISTRICT OF COLUMBIA

PRESENTATION OF certificates of life membership to eight members of the Section featured the annual meeting. Certificates were mailed to seven other members similarly honored, who were unable to be present. Recipients are: James P. Alvey, W. B. Bennett, Maj. G. M. Chandler, Roy Crum, W. G. Hoyt, F. E. Lamphere, Hugh Miller, Stanley H. Wright, Col. W. J. Barden, R. R. Benedict, W. L. Drager, D. C. Hayne, E. W. James, E. Newton, and Col. J. G. Steese. The annual election of officers resulted in the selection of C. D. Curtiss for president; Byron Bird, vice-president; Charles

Stevens secretary; and Waldo E. Smith, treasurer. Presentation of a film showing the construction of the roads serving the War Department's Pentagon Building concluded the program.

DULUTH

RECENT ACTIVITIES OF the Duluth Section include sponsorship of a highly successful two-day Northern Student Engineering Convention, to which the Duluth Junior College Engineers Club was host. Donald H. Jackson, Section member and instructor in civil engineering at Duluth Junior College, was instrumental in making arrangements. High light of the annual meeting of the Section was the presentation of certificates of life membership to Wayne A. Clark and John L. Pickles.

FLORIDA

USE OF TRANSITE pipe for municipal water supplies was outlined by W. B. Gibson at a recent meeting. Mr. Gibson, who is manager of the transite pipe department of Johns Manville Sales Corp., Atlanta, Ga., supplemented his talk with a sound film demonstrating the use of the product in a typical water supply project built during the war years. Robert M. Angas gave a report on the ASCE Fall Meeting at Jacksonville. Principal speaker at a special joint meeting of the Section and the University of Florida Student Chapter was L. J. Ritter, assistant professor of civil engineering at the university, who discussed soil mechanics.

GEORGIA

THE INDIVIDUAL ENGINEER must contribute more of his time and talents to the community in which he lives, ASCE President E. M. Hastings stated at the annual luncheon meeting on December 6. Mr. Hastings emphasized the necessity for unity of action among all engineers. A special feature of the meeting was the presentation of a certificate of life membership to Thomas H. Winchester. New officers for the Section, announced during the meeting, are: Van Porter Enloe, president; T. H. Evans, vice-president; and George A. Belden, non-resident vice-president. At the conclusion of the luncheon meeting, the group drove to Hapeville, Ga., where they were conducted through the assembly plant of the Ford Motor Co. The large attendance included representatives of the various Georgia technical societies and a group of Georgia Tech Student Chapter members.

ILLINOIS

POSTWAR TRANSPORTATION IN European cities was discussed by Charles E. De Leuw, president of De Leuw, Cather & Co., Chicago, at a joint meeting with the Western Society of Engineers. Mr. De Leuw, who recently visited several of the large cities in England, France, and Holland, compared the relatively light vehicular traffic in the cities visited with our own congested traffic conditions.

INDIANA

ASCE VICE-PRESIDENT Ralph B. Wiley and Mid-Western Representative George S. Salter were guests of honor and principal speakers at a two-day joint meeting of the Indiana and Kentucky Sections, held at Mitchell, Ind. Both discussed Society affairs at the Saturday night dinner meeting, commenting particularly on recent activities of the Board of Direction. Later the group adjourned to take part in the weekly community sing and barn dance, conducted by Dr. and Mrs. Edward Marshall. Sunday morning the group assembled for a showing of the General Electric film "Clean Waters," and later made a conducted tour through Spring Mill Village.

INTERMOUNTAIN

IN THE ABSENCE of the scheduled speaker, members devoted a recent dinner meeting to general discussion of Society and Section affairs. To increase the attendance of younger members and students, it was decided to substitute some low-cost buffet luncheons for the customary dinner meetings.

ITHACA

NEW OFFICERS FOR the Ithaca Section, elected at the recent annual meeting, are: Ernest W. Schoder, president; Frank Bolton, first vice-president; and Raymond Vreatt, second vice-president. Marvin Bogema will continue as secretary-treasurer. The speaker of the evening was Prof. Lyman P. Wilson, of the Cornell University Law School, who gave an account of a recent trip to South Africa.

KANSAS

AIRPORT PLANNING AND the overall needs of air transportation were discussed at a recent meeting by George W. Roseberry, chief of the planning section, Kansas City office, Civil Aeronautics Administration. Speaking on the same program, Harry J. Lichtefield, chief of the airport engineering division, Kansas City office, CAA, spoke on design layouts and the application of the 1946 CAA Congressional Act. The principal speaker at the December meeting was Ben Williamson, chief engineer of the Kansas State Board of Health.

KENTUCKY

THE FUNCTIONING OF the Society was explained in detail by ASCE Vice-President Ralph B. Wiley at the December 5 meeting. Professor Wiley stressed the changing trend of Society interests to include professional as well as technical activities, and described budget curtailments that have been made to meet the higher cost of operation with a fixed income. New Section officers, elected during the annual business meeting, are: W. R. McIntosh, president; Floyd Shrader, vice-president; John S. Kennoy, secretary-treasurer; and J. L. Leggett, corresponding secretary.

LOS ANGELES

CURRENT ATOMIC EXPERIMENTS, and future physiological dangers from atomic radiation, were discussed at the December 10 meeting by F. A. Bryan, assistant director of the atomic energy project and associate professor of medicine at the University of California, Los Angeles. Prof. Wesley L. Orr, of the new college of engineering at U.C.L.A., then discussed the college's plans for the future. High light of the occasion was the presentation of life membership certificates to twelve members. During the evening, the following new officers were installed: Ray L. Derby, president; D. Lee Narver and Arthur G. Pickett, vice-presidents; and Robert J. Kadow, treasurer. George E. Brandow will continue as secretary.

ASCE Western Representative Walter E. Jessup addressed the meeting of the Junior Forum that preceded the main meeting, summarizing the EJC report on "The Engineering Profession in Transition." New Junior Forum officers are: Thomas A. Binford, president; Stanley Goldhaber, vice-president; and John C. Merrell, Jr., secretary.

MARYLAND

RECENT DEVELOPMENTS in the field of plastics will revolutionize modern living, according to L. F. Livingston, manager of the extension division of the DuPont Co. Speaking on the subject of "Research and Better Living" at a joint meeting with the Engineers Club of Baltimore and its affiliated societies, Dr. Livingston described new uses for such materials as nylon and rayon, and emphasized the influence that new developments in the field of plastic research will have on the life of the average person.

METROPOLITAN

A PANEL OF engineers from the Port of New York Authority conducted a symposium on "Airport Development for the New York Metropolitan Area" at a recent meeting. Speakers were James C. Buckley, director of airport development, who described the Port Authority's regional airport studies and its suggestions for operation of LaGuardia, Idlewild, and Newark airports; Hervey Law, general superintendent of airports, who discussed the relationship between design and operation of airports; and A. E. Blomquist, consulting airport engineer, who

outlined the engineering problems involved in the design and layout of major metropolitan airports. An enthusiastic general discussion followed the scheduled talks. Attendance was about 325. At the December meeting Waldo G. Bowman, editor of *Engineering News-Record*, spoke on "European Reconstruction and the Marshall Plan" before an audience of approximately 350.

The Junior Branch of the Section met on December 10 to hear Archie Carter, Washington editor of *Engineering News-Record*, describe engineering design and construction in Cuba. Mr. Carter, who is a former president of the Junior Branch, illustrated his talk with slides he made on a recent Caribbean tour.

MIAMI

NEW FACILITIES THE Florida Power & Light Co. has under construction to meet increasing power demands in the southeast Florida area were described by E. F. Johnson, engineer for the company, at the December meeting. Stating that the present power load is double that of 1935 and that the first of three new units now under construction will not be ready for operation until November 1948, Mr. Johnson recommended that home owners rely on oil rather than electricity for heat during the present winter. Edmund Friedman was elected president of the Section in the annual election of officers, and W. C. Gorman, secretary-treasurer.

MICHIGAN

VETERANS MAKE FINE students, according to Arthur R. Carr, dean of engineering at Wayne University, who addressed a recent meeting in Detroit. The veterans constitute about 90 percent of the present engineering enrolment at Wayne, Dr. Carr pointed out, stating that they are as good students as any who ever attended the college. Other speakers included ASCE Director L. M. Gram, who described the organization and operation of the Society and urged his hearers to take an active part in Society affairs, and G. Brooks Earnest, chairman of the ASCE Committee on Student Chapters, who discussed Student Chapter aims and activities. The principal speaker at another recent meeting was M. P. Brokaw, regional highway engineer for the Portland Cement Association, who described recent developments in concrete road design and construction.

MID-MISSOURI

PRODUCTION OF CONTOURED topographic maps from aerial photographs by the multiplex method was discussed at a joint meeting with the Engineers Club of Jefferson City by C. L. Sadler, central division engineer for the U.S. Geological Survey. Mr. Sadler supplemented his talk with a film, and a demonstration with a multiplex machine was given by A. C. McCutchen and C. W. McCaw, of the U.S. Geological Survey. The Section recently held a meeting in conjunction with the eleventh annual convention of the Missouri Society of Professional Engineers. One of the speakers on the technical program was ASCE Past-President W. W. Horner, whose topic was "Objectives, Procedure, and Some Implications of the Meramec Basin Study."

MID-SOUTH

A DIVERSE PROGRAM of technical papers, inspection trips, and social events featured the two-day annual meeting of the Section, held in Jackson, Miss., December 5 and 6. Speakers on the technical program included James H. Martin, director of the Jackson Building Department, who discussed soils problems in the Jackson area, and Frank Fort, chairman of the Land Use Committee of the Jackson City Planning Commission, who spoke on city planning. Both papers aroused considerable local interest. Special speakers were ASCE Director Harry F. Thomson, who addressed the Friday luncheon meeting on the subject of Society affairs; Tom Q. Ellis, clerk of the Mississippi Supreme Court, who spoke at the annual banquet; and Leif J. Sverdrup, St. Louis consultant, who discussed "American Interests in the Middle East" at the Saturday luncheon. New officers for the Section, elected during the annual business session, are: Lee H. Johnson, president; Eugene F. Bespalow, vice-president; and H. G. Dewey, Jr., secretary-treasurer. There was a record registration of 170 for the two-day session.

NEW MEXICO

IN A TALK on "Interstate River Compacts," given at a recent meeting, John Bliss, state engineer, pointed out the desirability of compacts over court decisions. Mr. Bliss dealt particularly with compacts directly affecting New Mexico, expecially those regulating water use of the Pecos and Rio Grande rivers. A lively discussion from the floor followed his talk.

NORTH CAROLINA

DESIGN STANDARDS FOR interstate national highway systems were described by B. P. McWhorter, division engineer for the Public Roads Administration at Atlanta, Ga., at the all-day fall meeting of the Section. Other speakers appearing on the technical program were: W. H. Meyers, Jr., photogrammetric director, Lockwood, Kessler & Bartlett, Brooklyn, N.Y., who discussed the use of photogrammetric mapping for preliminary highway location; and Kenneth L. Coltrin, chief of the Flood Control Branch of the Norfolk District of the Army Corps of Engineers who spoke on planning and design of the Buggs Island Dam and Power House. Local Section and Student Chapter affairs were discussed by John D. Watson, Section representative at the Jacksonville Meeting, and J. R. Armstrong, member of the North Carolina State College Student Chapter.

NORTHWESTERN

A TALK ON engineering and other conditions in India comprised the technical program at the December meeting of the Section. This was given by L. G. Straub, head of the civil engineering department at the University of Minnesota, who recently returned from a trip to India, where he was consultant to the government on the proposed hydroelectric and irrigation project on the Godavari River. Section officers for 1948 are: Harry L. Wilson, president; Edgar A. Goetz, first vice-president; Charles W. Fritzius, second vice-president; and Frank S. Altman, secretary-treasurer.

PHILADELPHIA

THE EXTREME IMPORTANCE of geologic investigations during studies for large engineering projects was emphasized by Frank E. Fahlquist, consulting engineer and geologist, at a recent Section meeting. Speaking on the subject, "Geology as Related to Civil Engineering," Mr. Fahlquist showed that lack of expert knowledge of earth characteristics can cause disastrous loss of life and money in the construction of dams, reservoirs, power stations, and tunnels. Appearing on the same program, Jack B. Graham, associate geologist for the U.S. Geological Survey, discussed the geology of the Philadelphia region, and Edward A. Watson, professor of geology at Bryn Mawr College, described the geology of the suburban area. The talks were summarized by Joel D. Justin, newly elected ASCE Director and Philadelphia consultant.

SACRAMENTO

ASCE DIRECTOR F. W. Panhorst attended a recent evening meeting and led a discussion of Society affairs. At the same meeting Martin Blote, chairman of the Section's Legislative Committee, described the functioning of the committee and asked for a vote on whether or not Section participation in the Joint Legislative Committee of the state should be continued. The Section vote was in the affirmative. Col. Joseph S. Gorlinski, district engineer for the Corps of Engineers, addressed a recent luncheon meeting on the policy of the Corps with particular reference to the construction of the proposed Folsom Dam on the American River above Sacramento.

ST. LOUIS

WHAT HAPPENS IN the Rhine Valley in Germany and the Rhone Valley in France may determine the destiny of Western civilization, according to Waldo Bowman, editor of *Engineering News-Record*, who recently returned from a trip to Europe. In a talk, entitled "Reconstruction Plans and Prospects in Europe"—given at a joint meeting with the Engineers' Club of St. Louis, the St. Louis Chapter of the American Chemical Society, and the Washington University Student Chapter—Mr. Bowman advocated immediate construction of dams to increase the hydroelectric power production of the Rhone and rebuild French industry. Another priority project, he declared, is the clearing of wrecked bridges and other obstacles to navigation from the Rhine because of its tremendous importance as an artery of transportion for German industry.

SAN DIEGO

INSPECTION OF the new 18-acre plant of the National Iron Works highlighted a recent luncheon meeting. Production of the steel fabrication department ranges from 500 to 1,100 tons a month, and the output goes to a wide variety of West Coast industries. As a safety feature, all gas, water, and power facilities are underground. Construction features and operation of the plant were explained by Greer Ferver, chief engineer of the National Iron Works. Members of the San Diego branch of the ASME were guests of the Section for the luncheon and inspection trip.

SPOKANE

THERE WAS A capacity attendance at a recent all-day joint meeting with the Student Chapters at the University of Idaho and Washington State College at Coulee Dam. The morning and afternoon sessions were devoted to inspection of the main canal and tunnel near Coulee City, the south dam and outlet works of the balancing reservoir, the north reservoir dam site, the feeder canal, dry dock and bucket repair caisson. Special construction problems encountered in the building of the dam were discussed by L. V. Downs, field engineer for the Bureau of Reclamation at Coulee Dam, at the dinner meeting that followed inspection of the project. The other after-dinner speaker was A. J. Davidson, office engineer for the Bureau of Reclamation, who discussed the general features of the Columbia Basin Irrigation Project.

TACOMA

ASCE WESTERN REPRESENTATIVE Walter E. Jessup attended a recent dinner meeting and led a discussion on Society affairs. Principal speaker on the technical program was Bailey Tremper, chief materials engineer for the Washington State Highway Department, who outlined recent tests made on concrete pipe. The history, manufacture, and use of plywood were discussed at another meeting by Harry R. O'Brien.

TENNESSEE VALLEY

ESSENTIAL NUTRIENTS TAKEN from the soil in large quantities can and must be replaced by mineral nutrients, William Landess told members of the Knoxville Sub-Section at a recent meeting. Mr. Landess, who is head of the program exposition unit of the TVA's Agricultural Relations Department, supplemented his talk on the use of mineral nutrients for soil restoration by means of colored slides.

Guest speaker at a recent meeting of the Holston Sub-Section was George Akin, of Kingsport, Tenn., who discussed the significance of recent chemical engineering developments.

TEXAS

A THREE-DAY fall meeting on prewar scale, held at Fort Worth and Mineral Wells, was a high light in recent Section affairs. The Fort Worth Branch, meeting host, had arranged a diverse technical program. The list of speakers included: Frank C. Clayton, of the Consolidated-Vultee Aircraft Corp., who read a paper on "Runway Requirements for the B-36 Aircraft"; L. S. Waterbury, New York City consultant, who discussed the parking problem on the basis of a parking survey he recently completed for the City of Fort Worth; A. E. Dyatt, assistant superintendent, Airport Branch, CAA, who spoke on standards of airport design; Trigg Twichell, assistant district engineer, U.S. Geological Survey, Austin, whose subject was "Water Resources in West Texas"; and Rex R. Reed, planning engineer for the U.S. Bureau of Reclamation, Amarillo, Tex., who read a paper entitled "Planning the Optimum in Resource Development for Texas." ASCE Director Oscar Koch attended the meeting and spoke on Society affairs during the business session. The annual election of officers, held during the business meeting, resulted in the selection of James P. Exum for president; Mason Lockwood and James K. Alewine, vice-presidents; and I. W. Santry, secretary. The latter replaces John A. Focht, who is retiring as secretary after ten years in that post. A resolution of appreciation for his services was passed by the Section (see page 55 of this issue).

TOLEDO

CIVIL ENGINEERS must seek knowledge in fields outside engineering if they are to make the most of their profession, ASCE Mid-Western Representative George S. Salter told members of the Section at a joint meeting with the University of Toledo Student Chapter. The technical program for the occasion consisted of a talk on the organization and operation of the Ohio State Highway Department, given by W. B. Robison, division engineer.

TRI-CITY

NEW OFFICERS for the Section—elected at the annual meeting in Davenport, Iowa—are: A. R. Boudinot, president; A. F. Burleigh, vice-president; and R. G. Stearns, secretary-treasurer. A talk on "Building Railroads in Alaska" comprised the technical program. This was given by H. P. Warren, chief of the operation division, U.S. Engineer Office, Rock Island, Ill.

VIRGINIA

CONSTRUCTION of the Inter-American Highway was discussed by Hal H. Hale, executive secretary of the American Association of State Highway Officials, at the fall meeting in Roanoke. Other speakers appearing on the afternoon technical program were Student Chapter members. John Cofer, representing the University of Virginia, discussed his practical experiences in the building of a reinforced concrete stadium; T. S. Cook, of Virginia Polytechnic Institute, related his experiences on the construction of the Pan-American Highway; and George Eng, of Virginia Military Institute, spoke on "China Today." Student Chapter activities were discussed in detail at the evening dinner meeting.

WISCONSIN

THE USE OF movable slab forms for building construction was covered by Robert C. Johnson, vice-president of the Siesel Construction Co., at a recent meeting. Use of this type of construction was demonstrated by slides of the construction of the Will Ross Warehouse, recently completed in Milwaukee. The 1948 panel of Section officers consists of: James G. Woodburn, president; O. Neil Olson, first-president; Fred M. Sloane, second vice-president; and Charles W. Yoder, secretary-treasurer.

WYOMING

WYOMING'S IRRIGATION and power development claims in connection with the Upper Colorado River Compact under negotiation between the states of Utah, Colorado, Wyoming, and New Mexico were outlined by State Engineer L. C. Bishop at a joint dinner meeting with the Cheyenne Engineers Club. The lively discussion that followed Mr. Bishop's talk brought out the claims of the other states concerned, and helped give a picture of the problems to be settled before the compact can be completed.

STUDENT CHAPTER Notes

UNIVERSITY OF DETROIT

ACTIVITIES OF THE Society were outlined at a recent meeting by ASCE Mid-Western Representative George S. Salter, who spoke on the relationship of the Society to the Student Chapters. Showing of films on earth-moving equipment and the construction of the Chicago subway concluded the program.

UNIVERSITY OF UTAH

THE UNIVERSITY OF Utah Chapter reports that it has diversified its programs to offset the rather concentrated civil engineering course. A committee of four student officers, under the direction of Don Shaub, senior, plans the programs for the weekly meetings. To date members of the Chapter have heard a lawyer reminisce about his interesting cases; a discussion of the Marshall Plan; a talk on the Central Utah Project; and a discussion of engineering salaries and advancement.

TEXAS TECHNOLOGICAL COLLEGE

CHAPTER OFFICERS FOR the 1947–1948 school year are: Charles E. McQuain, president; Jack Collins, vice-president; and Walter E. McGowan, secretary treasurer. At the first meeting of the new year, Bill Enlow was elected to represent the Chapter on the board of directors for the annual Engineers' Show. Guest of honor and principal speaker at the meeting was ASCE Mid-Western Representative George S. Salter

ASCE PRESIDENT E. M. HASTINGS receives ceramic plaque from Cadet Henry Scott, of Virginia Military Institute, in recognition of his long service as Contact Member for VMI Student Chapter. Presentation was made during recent Chapter meeting, at which Mr. Hastings spoke. Seated in audience are Faculty Adviser Marr (left) and Student Chapter President Matt Moyer.

LEHIGH

Recent speakers at Student Chapter meetings include Paul Karr, engineer of tests at Lehigh, who conducted commercial tests on various building materials; and R. J. McIntosh, manager of sales, Sheet Piling Department, Bethlehem Steel Co., who described the use of sheet piles in the construction of cofferdams. The Chapter's plans for an active year have aroused great interest and nearly doubled the 1946–1947 membership. The new roster of officers is: W. D. McLean, president; D. W. MacDonald, vice-president; W. L. Bencker, secretary; and L. S. Avakian, treasurer.

UNIVERSITY OF ILLINOIS

THE PUBLIC MUST be made to recognize the fact that engineering is a profession, ASCE Mid-Western Representative George S. Salter told members of the Navy Pier Branch of the Chapter at a recent meeting. In explaining the purposes and aims of the Society, Mr. Salter pointed out that the present trend is toward advancing the engineer professionally as well as technically. The Navy Pier Branch of the University of Illinois Chapter, which has its headquarters in Chicago, is taking an active interest in Society affairs.

WAYNE UNIVERSITY

A HIGH LIGHT in the fall activities of the newly organized Wayne University Chapter was a joint meeting with the Michigan Section, which gave an "installation dinner" in honor of the new Chapter. Section officers are: William C. Krell, president; William McClurg, first vice-president; Kenneth J. Baune, second vice-president; Frank E. Jeziorski, secretary-treasurer; and Edward C. Sylvester, Jr., corresponding secretary.

UNIVERSITY OF WYOMING

TO INCREASE PUBLIC and student interest in the Society, the University of Wyoming Chapter is planning to revive such prewar activities as joint Student Chapter meetings and regional conferences. Current officers are: Paul Rechard, president; Robert O'Connell, vice-president; Charles McBeath, secretary; and Jac Logan, treasurer.

COLORADO A & M COLLEGE

ALL-DAY INSPECTION of the Eastern Slope installations of the Colorado-Big Thompson Project constituted a high light in the fall activities of the Student Chapter. The group of about 50 had an opportunity to view a variety of hydraulic installations, including the 13-mile Adams Tunnel and the shorter Prospect and Ramshorn tunnels, Aspen Creek siphon, the Estes Park surge tank, the four large earth dams of the Horsetooth Reservoir, and a number of minor works. At a recent meeting the guest of honor and speaker was H. Y. Hsu, chief design engineer, Yangtze Gorge Project of China, who gave an illustrated lecture on the projected dam project for the Yangtze Gorge just above Ichang, China.

OBJECTIVE OF RECENT inspection trip of Colorado A & M Chapter was Colorado-Big Thompson Project. Photograph (right) shows placing of forms and reinforcing steel for section of Aspen Creek Siphon.

COLORADO A & M COLLEGE group pauses atop Spring Canyon Dam, Horsetooth Reservoir, on inspection trip to Colorado-Big Thompson Project. Fill is about half completed.

NEWS BRIEFS

Construction Volume This Year Expected to Top 1947 Figure by 13 Percent

PHYSICAL VOLUME of new construction next year is expected to be about 13 percent higher than in 1947, David S. Miller, president of the Producers' Council, national organization of building products manufacturers, stated recently. The forecast, based on estimates by the Council's economists, places the 1948 building volume at about 14 billion dollars based on current costs, as compared with an estimated 12.4 billion for this year, but points out that estimates for the second half of 1948 are highly tentative, owing to political and psychological factors which cannot be anticipated with any degree of confidence at this time.

Public Works Account for Half of Increase

Public works and other government financed construction are expected to account for more than half of the anticipated increase. "Public construction next year is estimated at about $3.8 billion, an increase of 30 percent over the 1947 total," Mr. Miller said. "At that rate, the volume of publicly financed construction would account for 27 percent of all new building. Public construction, which totaled 22 percent in 1946, will account for about 24 percent of all new building in 1947. The largest dollar increase in public works is expected in highway construction, which is forecast at 1.5 billion, an increase of about one-third over 1947.

"A slight decline is anticipated in the volume of publicly financed residential building, but expenditures for non-residential projects such as schools, public hospitals, recreational facilities, and administrative buildings are expected to rise to $775 million, an increase of 52 percent. Other public construction, including sewage disposal, water supply, conservation and development work, and airports should increase about 29 percent in value, according to the forecast.

"A gain of about 5 percent is estimated in military and naval construction.

"All values are expressed in terms of costs prevailing in October 1947."

$10.2 Billion Private Building in 1947

"New private building in 1948 is estimated at $10.2 billion, an increase of 8 percent over 1947," Mr. Miller stated. "Private residential construction is expected to rise 12 percent in dollar volume, according to the forecast. An increase of 25 percent is anticipated in commercial building, 11 per cent in farm building, and 14 percent in public utility construction. A decline of 23 percent is forecast in industrial construction. Although the total dollar volume of new construction in 1947 will be about 25 percent higher than the 1946 total, the increase in physical volume will be only about 5 to 10 percent higher."

$6 Billion Maintenance and Repair

Expenditures for maintenance and repair of existing buildings are expected to total about $6 billion in 1948 or about the same as in 1947, according to the forecast quoted by Mr. Miller. "With repair work included, the total volume of all building next year, including new construction, is expected to approximate $20 billion," he stated.

"The demand for repair and maintenance has been especially heavy since the end of the war because such work was curtailed by federal controls until the middle of 1947 and because the high level of incomes has encouraged considerable volume of improvements to homes, farms and places of business.

"Prior to the war, the largest amount spent for repairs and maintenance in any one year was $3.6 billion in 1929. Expenditures for improvements and repairs rose to new records during the war and the result is reflected in the recent sample housing census made by the Bureau of the Census. According to the Bureau's report, only 7.9 percent of all non-farm housing units needed major repairs as of April 1947, whereas the 1940 census had reported 14.1 percent in that category.

"Although improvements such as reroofing, insulation, new plumbing installations, painting, and other maintenance work may have taken nearly one-third of the building materials utilized this year and may require an equal quantity in 1948, the percentage taken from next year's increased production will be smaller."

1948 Supply Situation Predicted

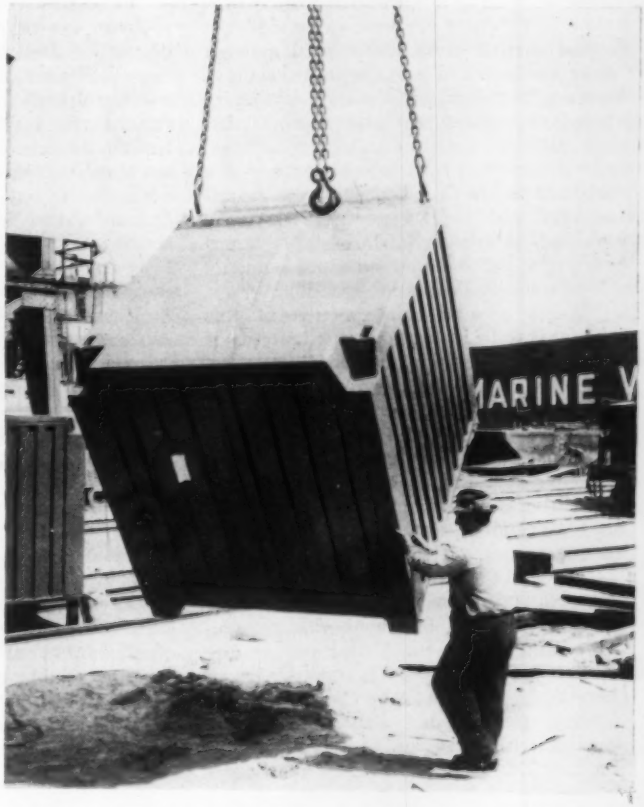
The building materials supply situation in 1948 is expected to vary from "comfortable" to "fairly adequate" with the probable exception of steel and steel products, according to the Producers' Council forecast quoted by Mr. Miller.

"The coming year will see a further improvement in the supply of the vast majority of materials, and a continued building up of dealers' inventories," the spokesman for the Producers Council said. "This forecast must be qualified, however, in view of the announcement that the Administration is seeking authority for allocation and control over the use of basic products. Even though housing or construction as a whole might receive favorable treatment in such a control system, the imposition of controls could seriously interfere with the progressive reestablishment of orderly markets.

"The degree of materials shortages next year also will partly depend upon ultimate

Tests Ruggedness of Shipping Container

RESISTANCE TO rough handling, protection against roll and vibration stresses, and immunity to water spoilage are merits claimed for 276-cu ft welded steel shipping containers developed by the Dravo Corporation of Pittsburgh. Handling lugs are recessed in upper corners shaped to take container legs, permitting close tier storage. Under severe test, container is lifted by two rear lugs so that full weight of 14,000-lb contents is thrust against double doors secured at top and bottom by latches as protection against theft. Doors are framed by 11-gage steel stripping rendering container weathertight.



decisions in respect to foreign aid. So far as building materials are concerned, the indirect impact of a foreign-aid program, accompanied by steel and freightcar shortages, is likely to be more important than direct demands for building products.

"The physical volume of total new construction expected to be put in place during 1948 is 10 to 20 percent below the 1941 volume. During the summer months of 1947, production of most building materials was at or above the average rate of 1941 output. If this rate is maintained the difference between physical construction volume and materials production should provide an ample margin for an increase in inventories plus, in some cases, more deliveries to foreign countries. For there was no semblance of materials shortages in 1941."

Economical Airport Planning Requires Cooperation of Airport and Aircraft Designers

Timely Subject Is Discussed at Meeting of Automotive Engineers

THAT COOPERATION between airport and aircraft designers is necessary for the establishment of fixed standards for airports was brought out by Harry Otis Wright, Jr., M. ASCE, chief engineer of Public Airport Services, Inc., at the recent National Air Transport Engineering Meeting of the Society of Automotive Engineers in Kansas City, Mo. In his paper on "Economical Airport Planning" Mr. Wright stated that the most important objective of economical airport planning is the establishment of fixed standards for airports so that they can adequately accommodate present and future aircraft with a minimum amount of construction. "The method of establishing such fixed airport standards is probably the most controversial question in airport planning today," he said. Excerpts from his paper follow.

"During the seven-year period beginning July 1, 1946, the federal government will make available $500,000,000 to the local governments for the construction of new airport facilities under the Federal Airport Act. The communities will spend a much larger amount in airport construction pursuant to this act, for in no case will the federal contributions exceed 50 percent under the law, and in many cases, such as hangars, no federal participation will be involved. In addition, the larger communities, such as New York and Chicago, will receive in the way of federal assistance only a small amount of the costs which these communities will bear in constructing the facilities. Accordingly, during this seven-year period much more than a billion dollars will be spent in airport construction.

"Unless a substantial portion of this amount is to be ineffectually used, a greater amount of cooperation and coordination between the *airport* designers and the *aircraft* designers must be accomplished. The rapid developments daily occurring in the design of aircraft, particularly the transport and combat types, make this cooperation imperative if the airports now being built are to adequately serve the aircraft of even the near future.

"The goal toward which we should strive is to plan airports which will adequately serve present and future aircraft requirements and at the same time require the smallest possible amount of construction so that the burden upon the communities of building, operating and maintaining the airports will be decreased to the minimum. Whether this ideal can ever be reached is highly speculative. However, it should be possible to determine standards at this time which will at least substantially accomplish the ideal objective.

"The Civil Aeronautics Administration recently held hearings in Washington attended by members of the aviation industry and local governments for the purpose of assisting the CAA in formulating new runway standards. At this hearing, it was evident that there exists a serious difference of opinion with regard to whether such fixed runway standards can be accomplished. The cities and states which have the burden of furnishing a large proportion of the construction funds, and the sole burden of maintaining and operating the airports, took the position that the aircraft of the future should be designed to operate from the airports now being constructed under the Federal Airport Act. The aircraft industry on the whole felt that such a position might constitute a serious restriction upon the development of future aircraft.

Recommends Joint ASCE and SAE Committee

"It would appear that the answer to the problem can best be obtained by lengthy discussions and compromises among the industry members, both the airport designers and the aircraft designers, in which a sound standard for the future can be devised. A hearing before a government agency can never accomplish this result because there is not sufficient opportunity for the necessary give-and-take discussion so essential to reaching desirable compromises. Therefore, I suggest that a standing joint committee composed of representatives of the American Society of Civil Engineers, the Society of Automotive Engineers, the Institute of Aeronautical Sciences, and other industry members, be established at once for the purpose of accomplishing coordination between airport and aircraft design, and to help the CAA establish standards which the local governments can economically follow in constructing new airports.

"The adoption and acceptance by the industry of fixed standards for airports, particularly for the larger communities, and the single long or heavy runway plan for the small communities would effectuate savings of substantial amounts in airport construction and would guarantee to the aircraft industry an adequate network of nationwide airports which would be capable of accommodating at all times the latest type of aircraft coming into production."

More Engineers Are Needed by Bureau of Reclamation

SUPPLEMENTING its previous announcements of open examinations for certain engineering positions with the Bureau of Reclamation, the U.S. Civil Service Commission has announced similar open examinations (until further notice) for positions in Grades P-2 and P-3 carrying salaries of $3,397 and $4,149 a year, and in Grades P-5 to P-8, carrying salaries between $5,905 and $9,975 a year. These positions are in all branches of engineering including civil, construction, hydrologic, irrigation, materials, structural, electrical and mechanical.

The announcement states that applications are desired from individuals whose training and experience qualify them particularly for engineering or engineering administrative work within the specialized scope of the Bureau of Reclamation. Positions are to be filled in the states of Oregon, Washington, California, Arizona, Nevada, Idaho, Montana, Wyoming, Colorado, New Mexico, Utah, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas.

Basic requirements for Grades P-2 and P-3 include an engineering bachelor's degree or four years of progressive technical engineering experience. For Grades P-5 to P-8, four years of progressive technical engineering experience are required and also bachelor's degree, or a combination of the two. Additional requirements for Grades P-5 to P-8 include four years of broad and progressive professional engineering experience. No written test will be given. Candidates will be rated on their training and experience relevant to the duties of the position.

Information and application forms may be secured from most first- and second-class post offices, from Civil Service regional offices, or from the U.S. Civil Service Commission, Washington, 25, D.C.

Code Encourages Use of New Materials and Methods

FLEXIBILITY IN BUILDING REGULATIONS and wider use of more modern materials and methods are claimed as benefits which would follow general adoption of a new national building code drawn up by 70 experts for the Building Officials Foundation organized last year by the Building Officials Conference. The publication *Business Week* reports that the code will soon be published for study and criticism by the building industry from which a sum of $600,000 is sought to finance the foundation—$60,000 has already been raised.

Setting up of performance standards for materials, with the Foundation itself a testing agency, instead of mere specification of materials allowed in construction as is followed in many local building codes, was the original intention of the framers of the new code, but reports indicate a compromise had to be made among the views of the many consultants, on its purely functional purpose.

Influence of Toll Bridges on Highway Traffic Is Subject of Report

RECENT STUDIES of two toll bridges over the Kanawha River near Charleston, W.Va., by the Yale Bureau of Highway Traffic, indicate that amortization over long periods of time through funds collected as tolls tends to create a reservoir of stranded traffic, diverting a large percentage of the total volume to free facilities. Removal of tolls increased traffic over the two bridges studied by as much as 53 percent, thus relieving congested conditions on two nearby free bridges.

Another observation included in the report on "Toll Bridge Influence on Highway Traffic Operation," is that "motorists place a high cash value on their time." Using a mathematical formula for evaluating the time saved by highway users of toll facilities, provided the origin and destination of traffic are known, the report shows that in West Virginia motorists value their time from seven-tenths of a cent to slightly more than one cent per minute. It shows, on the other hand, that when the Boston Post Road and Merritt Parkway are compared on the basis of the same formula, the motorist traveling between New York and New Haven values his time up to 1.28 cents per minute.

Further findings listed in the report, which was prepared by M. Earl Campbell, formerly state planning engineer of the West Virginia State Road Commission and now with the Highway Research Board in Washington, D.C., include the following:

1. The toll system is generally accepted as an expedient, as a questioned resource.
2. Public impatience for eliminating or reducing tolls on a facility increases with time. A toll project which elicits public favor in the beginning may be the object of marked disfavor in the end.
3. There must be a positive economic and social need for the toll facility coupled with an economic environment adequate to support the toll system and amortize the debt in a reasonable length of time.
4. The accrued community benefits from a toll facility must outweigh the economic and social disadvantages which it incurs.
5. Generally, the toll facility should be operated under public ownership, or authority, and on a self-liquidating basis.
6. The perpetuation of tolls on a fully amortized facility to protect the financial stability of an adjacent toll structure may not be necessary. Each toll bridge is inherently protected if sufficient distance and travel time separate it from the next adjacent bridge. Each situation should be the subject of a special study in cause and effect.
7. Toll systems have a profound economic and social effect upon a community.

Conference Promotes Closer Relations Between Contractors and Government Agencies

PROMOTION OF closer relations between contractors and government agencies in the interests of more efficient work was advocated by Col. W. W. Wanamaker, District Engineer, Baltimore Engineer District, in a recent address before a group of some 40 engineers and contractors at his office in Baltimore, Md. Discussing projects in his district to be constructed in 1948 at an estimated cost of $24,000,000, the Colonel said, "The general purpose of this meeting is to acquaint you with our program in the construction field and to give general contractors information in order to assist them in determining which of these projects prove most interesting from a specialized point of view." He stated further that he had always found it conducive to greater efficiency when relations between contractors and government agencies were pleasant and more clearly understood."

Included in the 1948 program of the Baltimore Engineer District are eight flood control projects—three at Williamsport, Pa., three at Sunbury, Pa., and two at Elmira, N.Y., all of which will lessen flood dangers in the Susquehanna Valley. Military work comprises three veterans' hospitals—at Wilkes-Barre and Harrisburg, Pa., and Baltimore, Md.

Speaking for the engineer-contractor group, which included several ASCE members, D. W. Winkelman, Syracuse, N.Y., expressed thanks to Colonel Wanamaker and his staff for "taking us into your confidence and talking over the future work of your office." He stated further that the conference "has been of service to all of us."

Traffic Volume Strains City Streets and Highways

AN INDICATION of the problem that is beginning to plague officials who must provide adequate facilities for traffic expansion is seen in a recent study made by the Public Roads Administration. Traffic volume in July 1947, according to statistics compiled by PRA, shows a sharp increase over the same period in 1946. Current monthly trends show similar increases over corresponding months in 1946, resulting in greater strain on all existing street and highway facilities.

Main-road traffic for July 1947 showed an increase of 11.9 percent over the same month in 1946, and city street traffic increased 5.8 percent in the same period. On rural roads the monthly traffic was 9.8 percent over July 1946 and 3.3 percent above that for July 1941, setting a new all-time high record of vehicle miles on rural roads in a single month.

In a traffic-trend bulletin based on PRA records, the traffic engineering division of the National Conservation Bureau, accident prevention section of the Association of Casualty and Surety Companies, notes a sharp increase in traffic volume during 1946 when an all-time high of 340 billion vehicle miles was reached. This figure is 3.6 percent greater than the previous record of 1941 and 65 percent above that for the war year 1943.

Traffic fatalities in 1946 according to the National Safety Council were 33,700 (less than 10 per 100 million vehicle miles). This figure is 16 percent below the 1941 total. Compared however with actual totals for 1945, with no consideration of increased volume, fatalities in 1946 were 20 percent higher—33,700 against 28,070.

Predicts Increase in Traffic Volume of 50% in 10 Years

TRAFFIC VOLUMES will increase 50 percent in the next ten years and add appreciably to the congested and hazardous conditions of city streets, Henry K. Evans, Assoc. M. ASCE, director of traffic engineering for the National Conservation Bureau, told officials of Williamsport, Pa., when he presented a final report on traffic conditions in that city. The 84-page report, detailing the results of a traffic survey made in Williamsport by the Bureau, was presented at a luncheon attended by city officials and members of local civic and safety organizations.

A study of traffic accidents in Williamsport over the past seven years revealed 41 deaths, 1,225 injuries and direct economic losses totaling $629,000, Mr. Evans reported. He urged the city to speed adoption of 43 recommendations outlined in the Bureau's report to reduce the accident rate, relieve traffic congestion and provide adequate parking facilities. The Williamsport survey was one of several recent studies made in cities of varying sizes by the Bureau, the accident prevention division of the Association of Casualty and Surety Companies.

Engineering Progress Show Scheduled for May 11 to 16

JUNIOR MEMBERS of the Engineers' Club of Philadelphia and the Franklin Institute of the City of Philadelphia are cooperating in sponsoring a second Engineering Progress Show in Franklin Hall, Franklin Institute, Philadelphia, May 11 to 16. The presentation will be similar to the first show which attracted more than 10,000 persons last year, and will feature exhibits depicting progress in engineering.

Nationally prominent engineers are being lined up for lectures during the show, and exhibitors now are contracting for booth space.

Committee Provides Guidance for Prospective Engineering Students in New York

IN COMPLETING ITS tenth year of service to high school students contemplating careers in the engineering profession, the New York Engineers Committee on Student Guidance, operating under the auspices of Engineers' Council for Professional Development, visited 26 high schools in the metropolitan area during the 1946–1947 season.

To carry on the work for which it was organized, the committee is currently composed of 80 members of the NewYork (Metropolitan) Sections of ASCE, ASME, AIME, AIEE, and AIChE. Small committees, generally five, constitute the usual panel for the visit to a particular high school, upon invitation of the school principal. Their function is to supplement with specific information the general background material already disseminated by the school's vocational counselors.

Short talks are given to groups of high school students explaining the functions of the engineering profession as a whole, the specialties of each branch, how an engineer is trained, and the personal qualifications and aptitudes needed to be an engineer. These visits feature a period in which students (and sometimes their parents) ask questions of the committee members. The meeting is terminated with a consultation period in which any student may ask in private any question concerning personal guidance.

Formation and operation of this committee has been motivated by the wide discrepancy between the numbers of freshmen that enter engineering schoools and those that graduate. The information provided enables prospective students better to evaluate their aptitudes and inclinations. The committee definitely avoids "selling" an engineering career to students; it is especially anxious that students who do not possess the needed basic aptitudes be advised to prepare themselves for other fields of work.

The committee is expanding its service so as to cover a wider territory within the New York metropolitan area. To carry on this increased work it is seeking additional volunteer members from the engineering profession. A large number of engineers are known to find satisfaction in helping to advise individual prospective students; this opportunity may now be realized with much wider effectiveness.

Civil engineers who are willing to participate in this worth-while work are requested to communicate with the chairman of the ASCE subcommittee, Alfred T. Glassett, Assoc. M. ASCE, vice-president, Wm. J. Barney Corp., 101 Park Avenue, New York 17, N. Y.

Pavement Surfaces Tested for Skid Characteristics

IN MORE THAN 1,000 measurements in tests made during a nine-month study by the Virginia State Highway Department, 27 out of 32 types of pavement were found to have satisfactory skid resistance qualities under wet conditions, and all gave satisfactory results when dry. Using natural and synthetic tires with good and worn treads at speeds of 10–40 mph, the tests showed that good treads offer greater resistance to skidding than smooth or worn tires, particularly on fine-textured surfaces.

Stopping distances on wet surfaces at a speed of 40 mph were generally 40 percent greater for worn than for good treads. Smooth synthetic tires under comparable conditions gave skidding distances about 12 percent greater than for smooth or worn prewar treads of natural rubber. At 40 mph, skids ranged from approximately 64–89 ft on dry surfaces and from 72–225 ft on wet surfaces. At the same speed new synthetic tires gave an average stopping distance of 70 ft on dry and 93 ft on all types of wet surfaces tested.

The tests were conducted mostly on high-type pavements, including bituminous concrete, sand asphalt, special plant-mix, rock asphalt, sand and slag seal treatments, broom drag treatments, portland cement concrete and glazed bituminous surfaces.

It was on surfaces with excess asphalt treatment that the least skid resistance and the greatest stopping distances were recorded. Under wet conditions, one of these pavements showed a skidding distance of 18 ft at 10 mph, 72 ft at 20 mph, 160 ft at 30 mph, and 254 ft at 40 mph.

Surfaces with a harsh, sandpaper-like texture were found to have short stopping distances, while long stopping distances were recorded on smooth, glazed surfaces. Application of non-skid treatment to smooth highways materially reduced the stopping distance. In one case, the skids measured on a wet surface at 40 mph were reduced from 224 to 94.7 ft after application of non-skid material.

The test car was a standard 1946 model 4-door sedan. Making a run, the car was leveled off at its test speed and the brakes instantly applied, locking all four wheels. At the instant the wheels locked, a detonator fired a chalk bullet onto the pavement. The stopping distance was measured from the chalk mark to the gun after the car had stopped. No attempt was made to measure side skidding. Results of the studies, made by T. E. Shelburne, M. ASCE, director of research, and R. L. Sheppe, Virginia Highway Department, are now published by the Highway Research Board, Washington, D.C.

Entire City Is to Be Surveyed from the Air

SETTING A PRECEDENT in the East, an entire city, New Rochelle, N.Y., is to be topographically mapped by aerial surveying or photogrammetry. The survey will provide a series of maps, on a scale of 200 ft to the inch with 5-ft contours, showing buildings, streets, parks, rivers and other features; a single over-all map 600 ft to the inch with 10-ft contours; and aerial photographs of the city.

Similar methods have been used for mapping smaller areas such as the 13×1-mile strip between New Britain, Conn., and Charter Oak Bridge in Hartford.

New Rochelle authorities placed the aerial mapping contract with the Photogrammetric Division of Lockwood, Kessler & Bartlett, Inc., Brooklyn, N.Y. Estimates indicate that the cost will be about 25 percent of that required for conventional ground surveys, and that the survey will take about six months as against approximately five years required for a ground survey.

Air Line Completes Part of $6,000,000 Program

FORMAL OPENING recently of Delta Air Lines' new headquarters adjoining its enlarged operating and maintenance base at the Municipal Airport in Atlanta, Ga., marks completion of one of the most fully integrated airline facilities in the South. Strategically located with respect to present and proposed passenger terminals, Delta's million-dollar expansion more than doubles the line's plant and office area in Atlanta, where a $6,000,000 municipal airport improvement program is under way.

Designed and built by The Austin Co. to provide compact and efficient facilities for the 1,000 maintenance and office personnel employed at Delta's principal traffic center, the enlarged layout includes executive and general offices, a new steel frame maintenance hangar with 187-ft span and 32-ft clearance for major overhaul of the largest planes in the line's service, plus extensive shop areas and an engine test building with two test cells, where a special installation of acoustical materials in the stacks has provided effective noise control.

The new hangar, with a clear depth of 15[illegible] ft, supplements space in an existing 130-ft span hangar, which is now available at all times for routine line service activities required by the airline's expanded operations. Total hangar area available is 40,000 sq ft.

Western Motor Carriers Form Research Institute

MORE ACTIVE PARTICIPATION of the Western motor transportation industry in matters of highway financing, location and construction is presaged in a recent announcement that leading Western interstate truck operators have joined together to finance a highway and taxation research organization, to be known as the Western Highway Institute.

The new organization, in charge of directors selected by the Western trucking associations, has established headquarters in San Francisco, Calif. In addition to accumulating research material for the Western trucking groups, the Institute will operate in close cooperation with the American Trucking Associations and other organizations active in the highway transportation field.

The Institute will soon begin long-range studies in truck taxation, highway planning and vehicle design. All work will be concentrated in eleven Western states only.

Virginia Will Spend $40,000,000 for Road Improvement in 1948

VIRGINIA'S LARGEST APPROPRIATION, $20,079,646 including $2,108,035 in federal aid, for construction and maintenance of its 48,000 miles of secondary roads during the fiscal year 1948–1949, has been announced by the State's Department of Highways. This sum exceeds the 1947–1948 grant by about 1½ million dollars. In addition, a sum of $20,000,000 has been set aside for construction on the state's 9,000-mile primary system during the same period. These expenditures are part of an estimated half-billion dollars to be spent on highway construction and improvements over the next 20 years.

Virginia is one of four states in the nation which is charged with the administration of virtually the entire rural road network within its boundaries. Direct administration by the highway department of farm-to-market roads has simplified handling of federal grants for secondary highways. Contracts have been let for virtually all of the first-year funds and a good part of the second-year funds have been programmed.

Since 1932 when the state took over the county roads, unimproved road mileage has decreased from 25,000 to 5,000. (For a comprehensive account of Virginia's 20-Year Plan for highway improvement see CIVIL ENGINEERING, December 1947, pp. 18–22.)

County Plans to Extend and Operate City Airport

IN AGREEMENT with city authorities who have had charge of the Rochester, N.Y., airport for many years, preliminary surveys and planning are under way for expansion and operation of the facilities by the Monroe County Board of Supervisors. Expected to begin in the spring of 1948 and to extend over a four-year period, the project includes lengthening of existing runways, construction of new runways, taxiways, a new administration area and building, and additions to the present lighting system, at an estimated cost of $4,500,000.

Reconstruction of the airport, aided by Civil Aeronautics Administration funds, is based on designs being prepared by Seeley, Stevenson and Value, ASCE members, New York consulting engineers, who will also supervise the work.

Steel Production in 1947 Presages Big Output in 1948

PRODUCTION OF MORE than 84,000,000 tons of steel in 1947 greatly strengthened the industrial economy of the United States, and accelerated the operations of many other industries, according to a recent announcement by Walter S. Tower, president, American Iron and Steel Institute. This tonnage sets a production record for a peacetime year.

Mr. Tower explains that "The principal reason for continued inability to meet every demand for steel has been the loss of more than 18,000,000 tons since the end of the war as the result of strikes and work stoppages." Larger output may be hampered by insufficient quantities of good-quality scrap, he said, which is the major reason why the industry was unable to operate at full capacity in 1947. Total domestic and foreign demands are expected to remain heavy. Steel production in 1948 should equal or exceed the output of 1947, barring interruptions from work stoppages or strikes and assuming there will be no shortages of raw materials of the proper quality.

In 1948, steel companies will have the benefit of some of the new producing facilities which have been under construction for a year or more, according to Mr. Tower. These are part of the industry's billion-dollar expansion program. Since the current scale of demand is abnormal and temporary, Mr. Tower points out that a balance between supply and demand for all types of steel may be reached by the expected high production of 1948.

Geological Survey Maps North Carolina Highways

COMPLETION OF PLANS for surveying and mapping some 3,000 sq miles in central North Carolina by the U.S. Geological Survey, in cooperation with the state's Highway and Public Works Commission, is announced by Secretary of the Interior J. A. Krug as the initial step in improving and widening the interstate highway system under the national postwar highway development program. Equal sums of $50,000 for the survey will be contributed by the Highway Commission and the federal government during the next two years.

Areas to be mapped extend from Winston-Salem and Greensboro in the north to Charlotte in the south. Maps and aerial photographs will serve as guides to highway officials in selecting suitable routes to meet increasing traffic demands. To permit highway planning and design studies to begin without delay, map compilations will be supplied to state engineers as soon as completed.

Uniform Code Announced for Small Jurisdictions

RELEASE OF a new "Uniform Building Code for Small Jurisdictions" was announced by the Uniform Building Code Association, national affiliate of the Pacific Coast Building Officials Conference, to the 270 members of the organization attending the 25th Annual Meeting held recently at the Grand Canyon in Arizona.

The new document is an abbreviated form of the basic document, the Uniform Building Code, and the small code is designed for jurisdictions of under 10,000 population, and to apply only to buildings not over 7,500 sq ft in ground floor area. The small code requires that all other structures comply with the parent Uniform Building Code, latest edition.

ASCE Members to Direct Moles' Award Ceremonies

THREE MEMBERS of the American Society of Civil Engineers, Charles B. Spencer, New York, Gen. Brehon B. Somervell, Pittsburgh, and Richard E. Dougherty, New York, will play prominent parts in conducting the ceremonies in the Roosevelt Hotel, New York, February 4, at which The Moles, New York society of tunnel and heavy construction men, will present their annual awards "for outstanding contributions to construction progress." Recipients will be Lt. Gen. Raymond A. Wheeler, Chief of Engineers, U.S. Army, and William A. Durkin, president, Walsh Construction Co.

As president of The Moles, Mr. Spencer will serve as master of ceremonies for the award presentations. General Somervell, winner of The Moles Award in 1944, will make the speech introducing General Wheeler, and Mr. Dougherty will speak as sponsor for Mr. Durkin. The function will be attended by 700 leading engineers and construction men.

Highway Research Board Holds Annual Meeting

A RECENT SPEED-UP in highway construction, despite the problem of high costs and limited supplies, was reported by C. D. Curtiss, deputy commissioner of the Public Roads Administration and secretary of the ASCE Highway Division's executive committee, at the 27th annual meeting of the Highway Research Board, held recently in Washington, D.C. In the latter part of 1947, the volume of highway construction averaged $80,000,000 monthly, Mr. Curtiss told the 850 highway experts in attendance. Subjects discussed in the 120 papers and reports presented at the four-day meeting included the human element in accidents, the need for polarized lighting to eliminate glare, heavy motor vehicle operation, highway planning, and traffic accident costs.

Featured at the general session on December 3 was the presentation of the Highway Research Board Award for a paper on airport runway evaluation judged of outstanding merit to Dr. Norman W. McLeod, of Canada.

F. V. Reagel, engineer of materials, Missouri State Highway Department, was elected chairman of the Board's executive committee, and Prof. R. A. Moyer, Assoc. M. ASCE, of Iowa State College, vice-chairman. Pyke Johnson, president of the Automotive Safety Foundation, was re-elected to the executive committee.

American Engineers Aid Turkish Government in Planning National Highway System

TWELVE CIVIL ENGINEERS of the Public Roads Administration left this country recently to assist the Turkish Ministry of Public Works in laying out a comprehensive system of all-weather highways. Headed by Harold E. Hilts, Assoc. M. ASCE, Deputy Commissioner, and Jesse E. Williams, Assoc. M. ASCE, the engineers will be joined by a small group of mechanics, machine operators and supervisors to train Turkish nationals in the various branches of road construction and maintenance, according to a recent announcement by Thomas H. MacDonald Hon. M. ASCE, Commissioner of Public Roads.

Mr. Williams, with wide experience in highways and forest roads, will be division engineer in charge of the American group with an office at Ankara. Mr. Hilts will remain only long enough to direct preliminary stages of the work. Expanding its highway department, the Turkish Public Works Ministry will cooperate with the division engineer's office in all planning and construction agreed upon as satisfactory to both agencies.

Specialists in planning, design, construction, bridges, testing materials, maintenance and equipment and finance, the American engineers will give first consideration to roads urgently needed, as Turkish economy has been greatly handicapped by lack of good motor roads.

In his comments on the Turkish road-building program Commissioner MacDonald made the following statement:

"Since funds are limited it seems desirable to resort to the policy of stage construction that has been used successfully in this country. Under this policy low and medium type surfaces are built with standards for grade and alignment suitable for progressive improvement. A high-type surface may be placed when required by traffic without loss of the initial investment."

American aid, mostly for machinery, equipment and general mission expenses, will be financed to the amount of $5,000,000 assigned by the State Department from the Turkish Aid Fund created by Act of Congress early in 1947. Equipment valued around $750,000 has been bought from the Army and is being shipped to Turkey. Right-of-way costs, labor, materials and detailed supervision will be paid by the Turkish Government which tentatively proposes also to finance a mission of Turkish highway engineers to this country where the PRA has agreed to arrange for their training in laboratory procedure and field construction.

Bid Calls on Western Projects Announced by Bureau of Reclamation

UNDER THE HEADING of "Bid Calls Expected This Month," the Bureau of Reclamation's *Advance Construction Bulletin* for December 1 announces work about to go forward on several large projects in Western States. According to the bulletin, all information published is subject to revision, but the data given will serve as a guide to the nature, size and location of the proposed construction.

COMPLETION OF DAM

Anderson Ranch Dam, Idaho

Location: South Fork of Boise River, 30 miles northeast of Mountain Home.

Work: Completion of excavation for spillway and outlet works; completion of placing concrete and reinforcement bars for spillway and outlet works; construction of power plant; installation of penstock and outlet pipes; installation of valves, gates, cranes, and hoists.

Excavation for spillway and outlet works	54,000 cu yd
Stockpile excavation	37,000 cu yd
Reinforced concrete	41,000 cu yd
Placing cobble and rockfill	54,000 cu yd

Time Allowed for Completion: 850 days.

PIPELINE AND STORAGE TANKS

Boulder Canyon Project, Nevada

Location: Boulder City, Nev.

Work: Furnishing and installing six miles of 12- and 14-in.-dia high-pressure steel pipe and erection of one 50,000- and one 2,000,000-gal storage tank.

Excavation	39,000 cu yd
Steel tanks	800,000 lb
Concrete	40 cu yd
12-in. steel pipe	265,000 lb
14-in. steel pipe	1,510,000 lb

Time Allowed for Completion: 270 days.

PIPELINES AND STRUCTURES

All-American Canal Project, California

Location: Vincinity of Indio and Coachella, Calif.

Work: Construction of structures and pipelines for distribution system in Units 2 and 3, including placing of 75 miles of precast concrete pipe from 12-in. to 45-in. diameter.

Excavation, pipe trenches	266,600 cu yd
Concrete in structures	810 cu yd

Time Allowed for Completion: 400 days.

PUMPING PLANTS

Klamath Project, Oregon-California

Location: Vicinity of Tulelake, Ore.

Work: Construction of pumping plants G, H, I, K, L, and M.

Excavation	4,600 cu yd
Placing 18- to 30-in.-dia concrete pipe	1,000 ft
Concrete	600 cu yd
Installation of pumping units	75,000 lb

Time Allowed for Completion: 240 days.

PUMPING PLANT

Klamath Project, Oregon-California

Location: Near Merrill, Ore.

Work: Construction of Adams 60-cfs pumping plant with wooden superstructure.

Furnishing and placing reinforcement steel	52,000 lb
Miscellaneous metal work	3,000 lb
Installation of pumping units	18,000 lb
Excavation	3,300 cu yd
Furnishing and placing trash-rack structures	9,000 lb

Time Allowed for Completion: 180 days.

WASTEWAY

Owyhee Project, Oregon

Location: Vicinity of Nyssa, Ore.

Work: Construction of earthwork and structures for approximately 3.5 miles of Locket Gulch Wasteway.

Excavation	280,900 cu yd
Furnishing and placing reinforcement steel	242,800 lb
Concrete	2,045 cu yd

Time Allowed for Completion: 270 days.

WASTEWAYS

All-American Canal Project, California

Location: Vicinity of Indio and Coachella, Calif.

Work: Construction of earthwork and structures, and lining Wasteways 2 and 3 for flood protective works.

Excavation, channels	371,000 cu yd
Excavation, structures	24,600 cu yd
Concrete, channels	9,200 cu yd
Concrete, structures	1,830 cu yd

Time Allowed for Completion: 360 days.

CANAL

Central Valley Project, California

Location: Near Visalia, Calif.

Work: Construction of earthwork, lining and structures of approximately 14 miles of Friant-Kern canal.

Excavation	2,803,000 cu yd
Concrete	97,000 cu yd

Time Allowed for Completion: 700 days.

TUNNEL AND CANAL

Riverton Project, Wyoming

Location: At the confluence of the Wind and Big Horn rivers near Pavillion, Wyo.

Work: Construction of Muddy Ridge Tunnel, approximately 2,870 ft long, about 2,000 ft of Wyoming Canal and extensions; about 2,000 ft of lateral.

Excavation	113,900 cu yd
Concrete	3,400 cu yd
Furnishing and placing steel tunnel supports	190,000 lb
Furnishing and placing reinforcement steel	188,000 lb
Timber lagging	113 Mb.m.

Time Allowed for Completion: 600 days.

PENSTOCKS

Davis Dam Project, Arizona-Nevada

Location: 30 miles west of Kingman, Ariz.

Work: Construction of five 22-ft-di welded, plate steel penstocks.

Time Allowed for Completion: 500 days.

R. Robinson Rowe, M. ASCE

"THIS IS a coincidence!" exclaimed Professor Neare. "Just before Adam Scrubal's scheduled talk on 'Esthetics of Elliptical Traffic Circles,' we are to discuss the location of a traffic circle so as to minimize travel between 3 cities."

"An ambiguous problem," alleged Titus Wadham. "You located the cities at 3

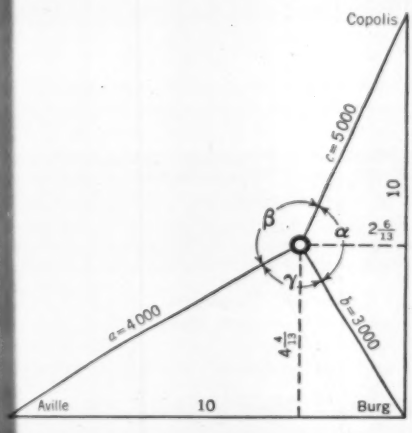


Fig. 1. Traffic circle in a three-point location.

corners of a 10-mile square and gave the traffic density, but did not specify the radius of the traffic circle. If we can neglect travel in the circle, suppose we make its radius 7.07 miles so that all 3 cities are on the circle and the effective radial travel is zero! If we can't neglect travel in the circle, is it fair to neglect the complete loops of bewildered drivers who miss the exit the first time around?"

"We'll neglect all quibblers and pragmatists," growled the professor.

"That excludes me in," said Joe Kerr. "I worked this problem once before and remembered Steiner's general solution that the 3 radial roads must protract equal angles of 120 deg. This clue made it an easy 3-point problem and I found the traffic center 2.988585 miles northwest of Burg."

"Joe's good memory forgot one thing," protested Cal Klater. "Steiner's problem was to minimize road mileage, not traffic mileage. This is a sequel to the Steiner problem with distances weighted by relative densities of traffic and analogous to the problem of static equilibrium of 3 forces proportional to these densities. The general solution may be expressed:

$$\sin \alpha : \sin \beta : \sin \gamma = a : b : c$$

where a, b and c are the radial densities and α, β and γ are the corresponding 3-point angles (see Fig. 1).

"In this case, $a:b:c$ = 4,000:3,000:5,000, so we may take for the 3-point angles those whose sines are 0.8, 0.6 and 1.0. Then any of various 3-point methods can be used to find the coordinates of the traffic center, 32/13 miles west of the Burg-Copolis meridian and 56/13 miles north of the Aville-Burgline. The aggregate daily travel is then $10{,}000\sqrt{65}$ = 80,623 vehicle-miles, compared to 90,000 via section-line roads and 72,426 via direct roads."

"Fine work, Cal. I can only add that the radial distances are in the proportion 7:4:5 and that the general method is practical in determining how near a highway through Aville and Copolis should come to a city near the direct line.

"Our new problem involves traffic in another way—the revenue from parking meters, all in pennies and nickels. A miserly traffic engineer, counting the day's gate, stopped to ponder when he noticed that the pennies came out even in rolls and found that if the number of nickels had been squared, the gate would have been three times as much as if the number of pennies had been squared. How much was the gate?"

[*Cal Klaters were Richard Jenney, Paul Seide, Ralph W. Stewart, A. Nuther Nutt, John L. Nagle, Ignor Antenuff (Paul Hartman) and Anne Othernut (J. Charles Rathbun). Also acknowledged are solutions from Uppan Atom (Count Harvey) of the lawn-mowing problem and from J. M. Brandstetter of the odd-weight weighing problem who proves that the answer should be 39 instead of 38.*]

Meetings and Conferences

American Road Builders' Association. The postwar highway construction program will be discussed in detail at the 45th annual convention of the American Road Builders' Association, to be held in Washington, D.C., January 26–28. Registration at the Mayflower, Statler, and Willard Hotels, January 26, at 8:30 a.m. The Airport Division of the ARBA will hold its annual meeting at the Mayflower Hotel, January 27, at 10 a.m

American Society of Heating and Ventilating Engineers. Every known device for promoting indoor comfort in an adverse climate will be exhibited at the 8th International Heating and Ventilating Exposition of the American Society of Heating and Ventilating Engineers, to be held in Grand Central Palace, New York City, February 2–6. Admission by invitation only.

Second National Materials Handling Exposition. Cost reduction through improved handling is the theme of the Second National Materials Handling Exposition, scheduled to be held at the Public Auditorium, Cleveland, Ohio, January 12–16, inclusive.

Society of Automotive Engineers. The annual dinner meeting of the Society of Automotive Engineers will be held in the Masonic Temple, Detroit, Mich., January 14. Application for tickets ($6 each) should be forwarded to SAE headquarters, 29 West 39th Street, New York City.

Plan Meeting of American Concrete Institute

MEMBERS OF CONVENTION COMMITTEE of American Concrete Institute plan features of annual convention, to be held in Denver, Colo., February 23–26. Highlights of diversified program include inspection of engineering laboratories of Bureau of Reclamation, field trips to nearby construction projects, and exhibits by construction industry. Photograph shows, left to right, Stephen H. Poe, Bureau of Reclamation, convention publicity; E. W. Thorson, Assoc. M. ASCE, Portland Cement Association, chairman of convention committee; O. O. Phillips, M. ASCE, R. J. Tipton & Associates, Inc., exhibits; Robert F. Banks, M. ASCE, Bureau of Reclamation, vice-president of ACI; and H. S. Meissner, M. ASCE, Bureau of Reclamation, program chairman. Messrs. Blanks and Meissner are recipients of Society's Thomas Fitch Rowland Prize (see page 46 of current issue).

Wool Gatherings by WOOLLEY

THE BELL XS-1, powered by a 4-unit rocket engine, is capable of going 1,700 miles an hour at an altitude of 80,000 ft.

108,000,000 PERSONS in the United States lack adequate water supplies.

FLOODS on the Mississippi in June reached crests that topped all-time records.

FIFTEEN POUNDS of plutonium can generate as much heat as 6 trainloads of coal.

LACK OF trained engineer personnel—because of low salaries—has hampered road building in 40 states.

DROPPING DRY ICE into a cumulus cloud from a high-flying plane produced a rainfall that lasted all afternoon and covered 20 sq miles of country about 100 miles north of Sydney, Australia.

WHEN MIXED in a new whitewash formula, DDT now works effectively in killing insects for 10 months.

A 10-IN. CRUDE-OIL pipeline 181 miles long is to be built to carry crude oil from the Rangely, Colo., oil fields to salt Lake City; estimated cost is $5,000,000.

CALIFORNIA has recently broadened its registration law to cover civil, chemical, electrical, mechanical and petroleum engineers. Mining engineering is left out.

A SEVEN-YEAR construction program to bring some 5,000,000 acres under irrigation has been started by the Siamese Government.

THE STATE of Washington's highway department employees are the best paid in the 11 Western states.

SEVENTY-FIVE-TON girders, 56 ft long, were too long and too heavy to be hauled over city streets in Rochester, N.Y.; they therefore traveled 166 miles by barge to get them from the Odenbach Shipbuilding Corp. plant on Dewey Avenue to the Brooks Avenue bridge, a distance of 15 miles.

THE COLLEGE of Engineering, University of Illinois, has been closed to further registration.

LAST YEAR property lost by fire cost Americans over $560,000,000.

A NEW asbestos-fibered aluminum roof coating reflects up to 80 per cent of destructive sun's rays and lowers temperatures under the roof 10 to 15 deg and makes the roof last longer.

New Publications

Engineers' Salaries. A 24-page booklet on "Incomes of Professional Engineers in Public Employment," prepared by Arthur Richards, M. ASCE, past-president of the American Association of Engineers, has been released by the Association. The publication contains grade descriptions for subprofessional and professional classes of engineering positions; discusses salaries in 1938, 1942 and 1947; compares salary increases with cost of living; explores the influence of size of population served; and offers a proposed guide for establishing equitable salary ranges for nine engineering grades. Copies are availabe at $1 each from the American Association of Engineers, 8 South Michigan Avenue, Chicago 3, Ill.

Runway Maintenance. The first bulletin in a projected maintenance series for airport managers has been issued by the Airport Division of the American Road Builders Association under the title of "Maintenance of Concrete Runways, Taxiways and Aprons." The 30-page illustrated bulletin—written by W. R. Macatee, manager of the Airport Division—may be purchased for 50 cents from the American Road Builders Association, 1319 F Street, N.W., Washington 4, D.C.

Housing Developments. Examples of rental housing developments, built and financed by private enterprise with mortgages insured by the Federal Housing Administration, are given in "Neighborhoods Built for Rental Housing," recently released as Land Planning Bulletin No. 4 by the FHA. Copies of this 24-page illustrated bulletin are available without charge to local planning boards from local FHA offices or from the Washington, D.C., office. Copies are available to the public from the U.S. Government Printing Office, Washington 25, D.C., at a cost of 15 cents.

Highway Research. The triaxial compression method of testing soils and application of the test data to the design of flexible pavements, as developed by the engineers of the Kansas State Highway Commission during the past six years, are described in Bulletin No. 8 of the Highway Research Board. Inquiries should be addressed to the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C.

Industrial Waste. Methods for determining, measuring and controlling industrial wastes are thoroughly covered in a 103-page illustrated volume, *Industrial Waste Disposal for Petroleum Refineries and Allied Plants*, recently released by the National Petroleum Publishing Co. The book may be purchased from the W. C. Platt Co., 1213 Third Street, Cleveland 13, Ohio, at a cost of $4.

Steel Products. Three new sections in the Steel Products Manual, which is being issued in installments by the American Iron and Steel Institute, are now available, at a cost of 25 cents, from the Institute, 350 Fifth Avenue, New York, N.Y. The present bulletins are Section 1, on "Pig Iron and Ferroalloys"; Section 3, entitled "Tie Plate Designs and Punchings"; and Section 12, dealing with "Hot Rolled Carbon Steel Strip."

Railroad Transportation. In "What's Ahead for the Railroads," the Association of American Railroads reprints two chapters from the 391-page final report of its Railroad Committee for the Study of Transportation, entitled *Transportation in America*. The present reprint outlines the general railroad situation and legislation affecting it. Inquiries should be addressed to the Association of American Railroads, Transportation Building, Washington 6, D.C.

Hydraulic Engineering. The application of wartime developments in the fields of hydraulic engineering and fluid mechanics to peacetime problems is discussed in the *Proceedings of the Third Hydraulics Conference*, released by the State University of Iowa as Bulletin 31. The Proceedings—edited by J. W. Howe, M. ASCE, and J. S. McNown, Assoc. M. ASCE—cover the 1948 conference, a cooperative project of the Iowa Institute of Hydraulic Research and the State University of Iowa. Copies may be obtained from the Department of Publications, State University of Iowa, Iowa City, Iowa, at a cost of $2.50 each.

Bridges. Photographs of some of the great bridges built by the New York consulting firm of D. B. Steinman, M. ASCE, constitute a 24-page brochure, entitled "Bridges." A brief history and description of each structure supplement the photographs. Inquiries should be addressed to D. B. Steinman, 117 Liberty Street, New York, N.Y.

Industrial Standards. The fourth in a series of standards applying the principle of modular coordination to building materials and equipment has been released by the American Standards Association. The present standard, dealing with "Sizes of Clay Flue Linings," may be obtained from the American Standards Association, 70 East 45th Street, New York 17, N.Y., at a cost of 35 cents a copy.

Airport Runways. Results of an investigation of the runways at a number of the principal airports in Canada are reported in Research Report No. 4B of the Highway Research Board, entitled *Airport Runway Evaluation in Canada*. Norman W. McLeod, author of the report, received an award for the report at the recent annual meeting of the Highway Research Board. Inquiries should be addressed to the Board, 2101 Constitution Avenue, Washington 25, D.C.

Registration of Engineers. A 1947 edition of the Digest of state laws governing the practice of engineering and land surveying and of State Board procedures has been published by the National Council of State Boards of Engineering Examiners. In three folded tables and 28 pages of textual supplements it lists the complete details of requirements in 48 states, Alaska, Hawaii, Puerto Rico, and the Model Law. The 23 pages of text give a summary of Board procedures pertaining to uniformity of requirements, examinations, reciprocity, and related matters. Copies are available at $2 from J. Keith Legare, Executive Secretary, NCSBEE, P.O. Drawer 1404, Carolina Life Building, Columbia, S.C.

NEW IN Education

ESTABLISHMENT OF "universities" for graduate engineers as an aid to the professional man just out of college was announced before the council of The American Society of Mechanical Engineers by its president, Eugene W. O'Brien of Atlanta. The council meeting in Atlantic City immediately preceded the five-day annual meeting of ASME there. According to the new program, an innovation in engineering education sponsored by the Engineers' Council for Professional Development, these "universities" will be set up in key cities throughout the nation. A pilot program is already under way in Detroit where the local engineering society and some 30 local sections of national technical societies will give courses, lectures and consultations to engineer graduates. The faculty will be composed of outstanding engineers in active duty in the area.

RESEARCH PROJECTS are already under way in the new hydraulics laboratory of the Georgia School of Technology, according to an article by Associate Professor Carl E. Kindsvater Jun. ASCE, in *The Research Engineer*, journal of the school's Engineering Experiment Station. Equipped through the generosity of two anonymous donors, the laboratory can solve problems concerned with production of hydroelectric power, conservation and regulation of domestic and industrial water supplies, flood control, spillway models, river navigation models, navigation locks, design of household plumbing fixtures, and general fluid-flow investigations.

A RESEARCH PROJECT to study and develop new and improved drainage methods for Utah's irrigated lands has been made possible by a $10,000 grant from the Utah Power & Light Co. to the Utah State Agricultural College.

MODERN METHODS of teaching sanitary engineering received an impetus with the recent dedication of the William Thompson Sedgwick Laboratories of Sanitary Science at Massachusetts Institute of Technology. Designed to provide the student with a thorough knowledge of the chemical and biological reactions which take place in the treatment of water, sewage, and industrial wastes, the new facilities consist of three laboratories—for sanitary bacteriology and research, sanitary chemistry, and sanitary engineering. Dr. John B. Wilbur, M. ASCE, head of the department of civil and sanitary engineering, presided at the dedication exercises. Speakers included three ASCE members: Prof. William E. Stanley, in charge of the new laboratories, who emphasized their value for thesis projects and for advances in research; Arthur E. Weston, M. ASCE, chief engineer of the Massachusetts Department of Public Health, who spoke on laboratory training and sanitary engineering practice; and Dr. Gordon M. Fair, M. ASCE, dean of engineering of the Harvard Graduate School of Engineering, who discussed the laboratory and sanitary engineering education.

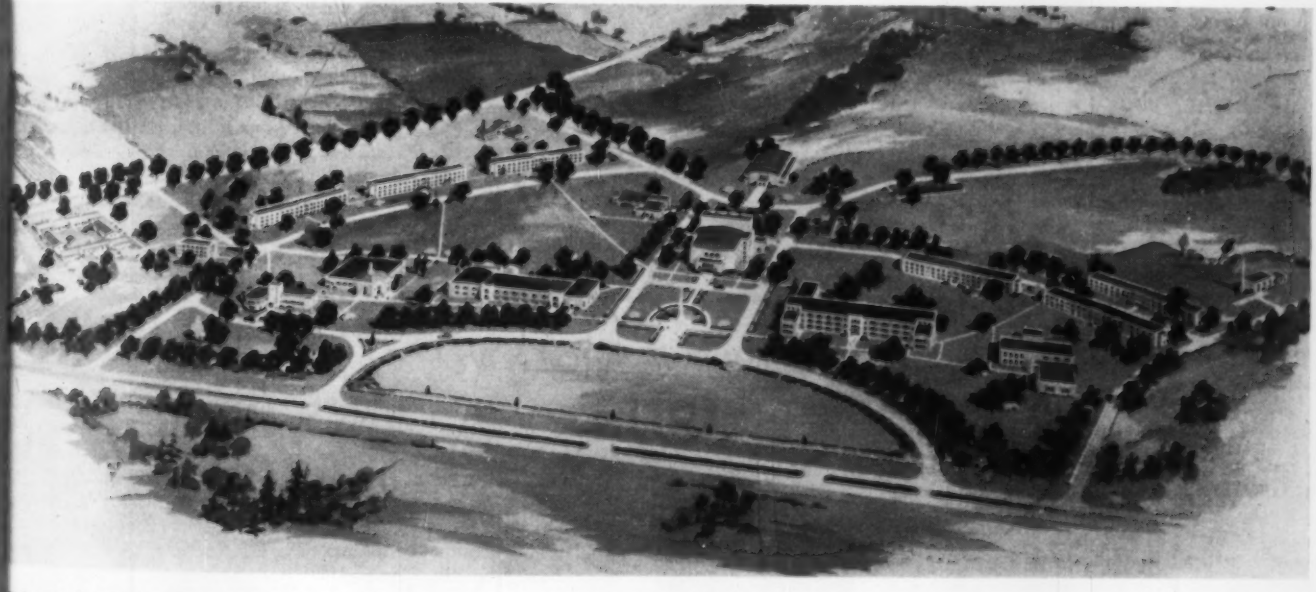
Postwar Teaching Problems Discussed at ASEE Meeting

MANY URGENT PROBLEMS raised by postwar doubling of enrolments and faculties were discussed by engineering teachers from 27 colleges in five states at the annual meeting of the Middle Atlantic Section, American Society for Engineering Education, held at Pratt Institute, Brooklyn, N.Y., December 6.

A session on the general theme of the engineering teacher and his skills was followed by twelve conferences on special topics. Separate sessions considered counseling and testing; use of visual aids such as projectors and motion pictures in technical education; course problems in English, mathematics and the several fields of engineering, and the place of the library in engineering education.

The civil engineering group, under the chairmanship of Prof. E. K. Timby, Assoc. M. ASCE, of Princeton University, conducted discussions led by several ASCE members—Professors H. L. Bowman of Drexel Institute, W. S. LaLonde, Jr., of Newark College of Engineering, J. M. Garrelts of Columbia University, and J. O. Eichler of The Cooper Union.

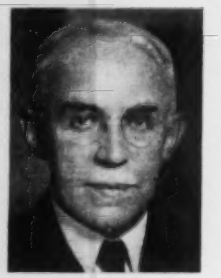
Teamwork Completes $3,500,000 College Campus in One Year



CONSTRUCTION OF COMPLETE university campus including 19 buildings with 440,000 sq ft of floor space at Greenville, S.C., in period of one year and in time for opening of 1947 fall term, has been possible through close cooperation of owner, architect and builder. Owner, Bob Jones University, in need of immediate expansion impossible at old location in heart of Cleveland, Tenn., let contract for new site to Daniel Construction Co. of Greenville, before architect James G. Gauntt, M. ASCE, of Chattanooga, and associate architect Leon Le Grand of Greenville, knew location of project and before plans were drawn. Owner-architect-contractor team worked out master plan with locations of buildings and utilities to permit orderly future expansion. Team chose functional mass silhouette for architectural treatment, designed to use materials quickly obtainable for fireproof construction. At cost of $3,500,000, or less than $8 per sq ft, unit provides facilities for 2,400 students. Ultimate expansion to 8,000-student capacity is envisioned.

NEWS OF Engineers

Rear Admiral Reuben E. Bakenhus, CEC, USN, retired, has been elected secretary of the American Institute of Consulting Engineers, New York City, succeeding the late **Philip W. Henry,** M. ASCE. Entering the Navy Civil Engineer Corps in 1901, Admiral Bakenhus was commissioned rear admiral in 1932 and retired with that rank in 1937. Since his retirement he has had a consulting practice in New York City, specializing in waterfront and harbor work, valuations, and expert court testimony. Active in the Society and Metropolitan Section, he served as ASCE Director from 1943 to 1945.



R. E. Bakenhus

Lawrence Talma Smith, principal architectural engineer of the Maryland State Health Department, has been honored with the grade of societaire of the Societe des Ingeneurs Civils de France. During the war, Colonel Smith filled various general staff and engineering assignments in French North Africa, and later was consulting engineer to the Ministry of Communications, the Chinese National Government, and UNRRA on the rehabilitation of the destroyed railroads of China. At present he is in charge of the coordination of the Maryland Hospital Construction Program.

H. H. Roberts, partner in the engineering firm of Moffat, Nichol & Roberts, Los Angeles, Calif., is chief engineer for Ozark Dam Constructors on the Bull Shoals Project. He was formerly chief engineer for the contractors, Pacific Naval Air Bases, during the construction of the Navy's advanced base depot at Port Hueneme, Calif.

Robert S. Taggart has accepted a position as assistant sanitary engineer for the National Biscuit Co., in New York City. Except for a period of wartime service in the Army Sanitary Corps, Mr. Taggart has been district engineer for the New York State Department of Health at Amsterdam, N.Y., for the past eleven years.

Gerald H. Frieling director of research for the Kansas City Public Service Co., Kansas City, Mo., has been named vice-president in charge of transportation. The governor of Missouri recently appointed Mr. Frieling to represent management in the newly created State Mediation Board.

Walter J. Kackley has resigned as consulting engineer for the Public Buildings Administration, Federal Works Agency, Washington, D.C., to join the engineering staff of the U.S. Atomic Commission in Washington.

Eldon J. Yoder, formerly of the Purdue University research staff, has accepted a position as assistant professor in the civil engineering department at Ohio State University.

William A. O. Wurts, assistant city engineer of Hartford, Conn., has been named the first manager of the Hartford Metropolitan District Commission in the initial step of the district's projected reorganization plan.

William R. Seeger was recently appointed assistant chief engineer of the Marin Municipal Water District, with headquarters in San Rafael, Calif. He was previously project manager of the engineering office of Clyde C. Kennedy, San Francisco.

Robert A. Thompson, Jr., is now assistant to W. D. Masterson, manager of the San Antonio, Tex., water system. Before joining the water board, Mr. Thompson was an Army engineer on military construction in Texas, Oklahoma and New Mexico.

Col. George W. Gillette, who is retiring as division engineer of the South Atlantic Division, Corps of Engineers, Atlanta, Ga., has accepted an appointment as executive director of the North Carolina State Ports Authority, with headquarters in Wilmington, N.C. Colonel Gillette will begin his new duties on January 1.

George E. Lyon has severed his teaching connection at the University of Minnesota to become assistant professor of civil engineering at Cornell University.

Hayse H. Black has accepted an appointment as associate professor of sanitary engineering at the University of Iowa. Until lately he was in Detroit, Mich., as officer in charge of the U.S. Section, International Joint Boundary Commission Water Pollution Investigation.

Mark G. Knight is now city engineer for Grand Coulee, Wash. He was previously concrete engineer for the Lehigh Portland Cement Co.

Homer A. Hunter has resigned as city manager of Lubbock, Tex., to establish a private consulting practice in engineering and management. During Mr. Hunter's two years as city manager, the city started the largest public works improvement program in its history. He will open his office in Dallas, Tex., early in January.

Sumner C. Willis is general superintendent in charge of construction of the first peacetime atomic pile at the Brookhaven National Laboratory on Long Island. Mr. Willis is construction superintendent for the H. K. Ferguson Co., industrial engineers and builders in charge of engineering and construction of the project.

Norman Kruchkow has severed his connection as engineer in the New York district of the U.S. Engineer Office to become assistant plant manager for the contracting firm of M. Gottfried, Inc., Stamford Conn.

Thomas R. Klingel, formerly division engineer for the Minneapolis, St. Paul & Sault Ste. Marie Railway, Minneapolis, Minn., is now assistant professor of civil engineering at the University of Minnesota.

James K. Finch, dean of the Columbia University School of Engineering, was named an "Officer del'Instruction Publique" and received the French "Ordre des Palmes Academiques" at a ceremony held at the office of the Cultural Division of the French Embassy on December 3. A former Director of the Society, Dean Finch has been associated with the Columbia School of Engineering since 1911.

Norman W. McLeod, consultant to the Canadian Department of Transport, is this year's recipient of the Highway Research Board's annual award for an outstanding technical paper. The prize-winning paper, entitled "Airport Runway Evaluation in Canada," was presented at the 26th annual meeting of the Highway Research Board.

Edward J. Scripture, vice-president in charge of research for the Master Builders Co., was recently decorated with the French "Ordre des Palmes Academiques." A former colonel in the Army Corps of Engineers, with more than three years of service in the European Theater, Mr. Scripture received the award "for services rendered to science."

Charles E. Ryder has given up his consulting practice in Harrisburg, Pa., to join the staff of the Harrisburg engineering firm of Gannett, Fleming, Corddry & Carpenter, Inc. He will be chief of the water works and dam division.

La Vern J. Charles has retired as district engineer for the Public Roads Administration at St. Paul, Minn., after 42 years in government service.

"Look" Magazine Lauds Work of J. L. Savage, Hon. M. ASCE

WORK OF John Lucian Savage, chief design engineer, U.S. Bureau of Reclamation, who was elevated to Honorary Member of ASCE in 1941, is the subject of an article in the "*Look* Applauds" section of *Look* magazine in its issue released December 9.

J. L. Savage

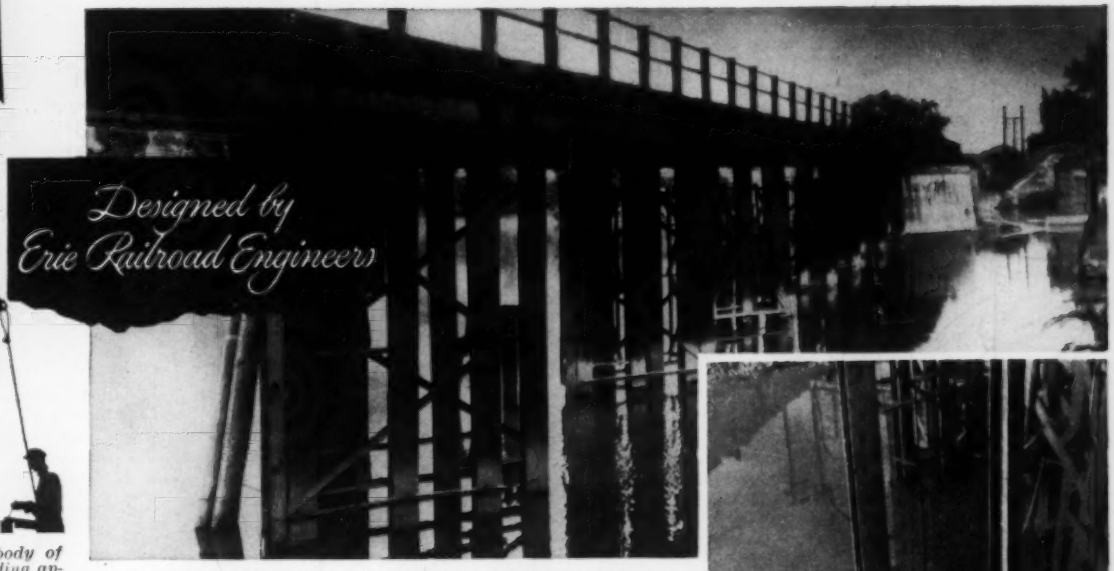
Together with his picture, *Look* presented the following regarding Mr. Savage:

"More people are indebted to him, and will be for generations to come, than to any other engineer. Grand Coulee Dam, the world's biggest man-made structure, and some 60 other hydroelectric and irrigation projects have been built to his specifications. These projects have opened up millions of acres for farms, industries and homes.

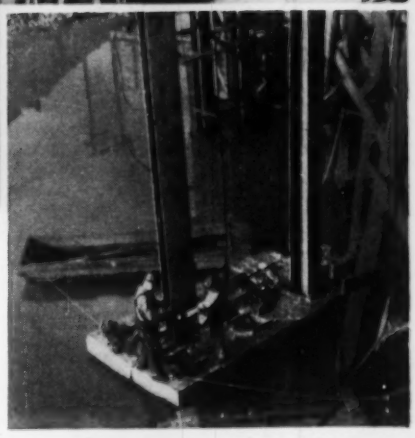
"Savage is chief design engineer of the U.S. Reclamation Service. But the demand for his talents has been world wide. Recently he's been working on projects in Europe, Asia and Latin America. Yet never has he sought a fortune. His main interest is only to take part 'in enterprises that have as their objective the development of human relations.' "

Ingenious New Hammer-Guide and Floating Template *plus* U·S·S STEEL BEARING PILES speed replacement of washed-out bridge!

Assembled about the body of the hammer and extending approximately 12 ft. below base of driving head, this ingenious device will pick up, carry, spot drop hammer and drive steel bearing piles.



General view of the steel pile trestle across the Chemung River, near Corning, N. Y. built to replace a washed out, three span, double-track bridge. Steel bearing piles were used when difficulty was encountered in getting timber piles started and in securing adequate penetration.



This floating template is composed of two halves which are unbolted and floated apart to free them from the driven pile bent, and then bolted together again at the location of the next row of piles.

When the Erie Railroad's double track bridge across the Chemung River, near Corning, N. Y. washed out during a flood in the Spring of 1946, only the most easterly of the three spans of the original bridge remained in place.

Following the usual emergency procedure, a single track timber pile trestle was driven in the opening created by the washed-out spans to permit two-way operation over the westward rails. However, because of the difficulty encountered in securing adequate penetration, and of getting the timber piles started in the rubble on the river bottom, the Railroad's engineers turned to U·S·S Steel Bearing Piles in rebuilding the south half of the bridge for the eastward track.

The design called for six-pile skewed bents, each with two lines of three piles each, with bents spaced on centers ranging from 30 ft. 9 in. to 36 ft. 3in. The design also called for prefabricated header beams for the bents and prefabricated vertical bracings between the piles, factors which required that the piles be driven true.

To facilitate driving, and to avoid interference with traffic on the westward track, the engineers developed a device which would pick up the steel piles from where they were set up near the end of the bridge, carry them to driving position, spot them in the specially designed floating template, and drive them with a steam hammer without conventional fixed or swinging leads, being supported only by the load line of the erecting crane.

That accurate driving was possible with the ingenious hammer-guide attachment and U·S·S Steel Bearing Piles, is seen in the fact that the template could be removed from many of the pile assemblies without binding. Also by the fact that prefabricated headers and vertical bracings of the bents were set in place and welded with only minimum adjustment of the tops of the piles.

The Erie's satisfactory experience further emphasizes the superiority of steel bearing piles in modern bridge construction. For detailed information on U·S·S Steel Bearing Piles, please contact the office nearest you.

PROVED STRUCTURALLY AND ECONOMICALLY SOUND

U·S·S STEEL BEARING PILES have proved their ability to provide a secure means of supporting foundations through unstable materials by their ability to go to firm strata at great depths. Their capacity for high unit loads, both vertical and horizontal, permits fewer piles and fewer driving operations for a given load. They are readily handled in the field by ordinary equipment. They are easy to splice. They eliminate jetting, and they withstand rough handling.

CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York
8-143

UNITED STATES STEEL

Norman H. Collisson, former Navy captain, who served as Coal Mines Administrator during the federal operation of the bituminous mines, has returned temporarily to the Department of the Interior as special assistant to the Secretary. In this capacity, he will coordinate and direct the various activities of departmental agencies engaged in work on the Marshall Plan. Upon the liquidation of the Coal Mines Administration, Mr. Collisson had already taken an executive position with an Eastern industrial company when his services were again called for by the government. He was granted a leave of absence from the company to return to the Department of the Interior until all programs dealing with foreign relief problems are operating effectively.

N. H. Collisson

Burton L. Winslow is now superintendent of buildings and grounds at Bennington College, Bennington, Vt. Formerly town and village manager of Bennington, Mr. Winslow has more recently been serving as town manager of Brandon, Vt.

Sanford W. Sawin has retired as design and supervising engineer for the DuPont Co., Wilmington, Del., after 32 years of service with the organization. Mr. Sawin recently conducted special studies, following wartime work for the company as supervisor of Richland, Wash., village of the Hanford Engineer Works. Mr. Sawin is a former Director of the ASCE.

Walter A. Heimbuecher, for the past 34 years city engineer of University City, Mo., has been appointed director of public works.

Arthur H. Woolverton, until lately with the U.S. Bureau of Reclamation in Denver, Colo., has become chief hydraulic engineer for the Texas Board of Water Engineers, with headquarters at Austin.

William R. Bandy has been appointed regional cadastral engineer for Region III of the U.S. Bureau of Land Management, with headquarters at Helena, Mont. Mr. Bandy, who has been acting regional cadastral engineer for the past year, will be in charge of engineering and cadastral surveys in Region III which includes eight Western states.

Nathaniel C. Saxe, consulting engineer, has moved his office from Brooklyn, N.Y., to 122 East 42d St., New York City.

Theodore O. Reyhner has resigned as associate professor of civil engineering at the University of North Dakota to accept a similar position at the University of Oregon.

James B. Vernon recently retired from the Huntington, Ind., Board of Public Works after half a century of service for the City and County of Huntington. One of the oldest civil engineers in public service, Mr. Vernon's retirement followed the celebration of his 89th birthday.

Albert E. S. Hall, principal architect and civil engineer for the Du Pont Co., Wilmington, Del., has retired after almost 30 years in the service of the company. During the war, Mr. Hall served on the design and layout of war plants for the organization.

Deceased

Harold Wallace Baker (M. '27) city manager of Rochester, N.Y., from 1934 to 1941, was fatally stricken at the wheel of his car in Ithaca, N.Y., on November 8. He was 59. Mr. Baker had been in the Rochester Municipal Research Bureau, and in 1924 was appointed commissioner of public works, serving until 1932. He then became director of construction in the U.S. Engineer Department, Washington, D.C. A veteran of both World Wars, Mr. Baker recently served in the Navy Civil Engineer Corps in Washington. Since the war he had been chief of the safety department of the Eastman Kodak Co., at Rochester.

James Edwin Boatrite (M. '13) of Germantown, Pa., died recently at the age of 68. Early in his career Mr. Boatrite was resident engineer for the New York City firm of Levering & Garrigues on the construction of the New York terminal of the Brooklyn Bridge and other metropolitan structures. Beginning in 1904, he was for a number of years general manager of the Guerber Engineering Co., Bethlehem, Pa. More recently he had been assistant engineer in the Philadelphia Department of City Transit.

Asa Clair Butterworth (Assoc. M. '14) president of the General Material Co., St. Louis, Mo., died in that city on November 5, at the age of 67. In 1910, after early work in railroad engineering, Mr. Butterworth organized the Southern-Construction Co., Little Rock, Ark., which specialized in river protection and revetment work. Later he was a partner in the Miller-Butterworth Corp., of Little Rock, in general construction work. Moving to St. Louis in 1925, Mr. Butterworth established the General Material Co., manufacturers of ready-mixed concrete.

Orville Vosbury Derr (M. '39) engineer for L. Morris Mitchell, Inc., of New York City, died in Mount Vernon, N.Y., on November 23. He was 62. Beginning in 1912, Mr. Derr was for many years with the Erie Railroad—first as resident engineer in charge of double-tracking and grade revision of several districts. Later he was assistant vice-president in charge of valuation of the entire system. During the first World War, Mr. Derr served overseas in the Corps of Engineers.

Charles Job Eldridge (Assoc. M. '29) of Bloomfield, N.J., died on September 6, at the age of 61. Mr. Eldridge spent his early career on subway construction in New York City and on the construction of the Catskill Aqueduct. From 1922 until 1943 he was assistant engineer on the valuation of structures for the Erie Railroad Co. More recently Mr. Eldridge had been appraiser for the American Appraisal Co., Milwaukee, Wis.

Erik Theodore Eriksen (M. '23) retired engineer of Portland, Ore., died on October 13. Mr. Eriksen, who was 84, was with the U.S. Bureau of Reclamation for many years, retiring in 1933. He had also served as water master, under the U.S. District Court, of all irrigation in Stony Creek Basin, California. Mr. Eriksen was recently made a Life Member of the Society.

James Benton French (M. '98) retired consultant, died at his home in Jamaica, N.Y., on December 2, at the age of 84. From 1904 to 1908 Mr. French was bridge engineer for the Long Island Railroad, and later served the Chesapeake & Ohio and other railroads in a similar capacity. From 1908 until his retirement a few years ago, he maintained a consulting practice, specializing in the design and construction of bridge structures for several railroads. He held patents on the design of electrically operated car float transfer bridges in use at several railroad terminals in New York Harbor. Mr. French was one of four surviving ASCE members who attended the Paris Exposition of 1889.

Philip Winthrop Ham (Assoc. M. '15) of Auburn, N.Y., died on November 29, at the age of 60. Mr. Ham was structural steel draftsman for the New York engineering firm of Post & McCord from 1910 to 1912, and resident engineer and chief engineer for the Great Western Power Co., of San Francisco, from 1912 to 1922. From the latter year until 1942 he was secretary and treasurer of the Auburn Iron Co., and more recently had been general foreman of the Columbian Rope Co., at Auburn.

Philip Walter Henry (M. '08) New York City consultant and vice-president and secretary of the American Institute of Consulting Engineers, died in a hospital in New York on November 7. He was 81. Mr. Henry was with the Barber Asphalt Co. from 1887 to 1902, becoming vice-president and general manager. He planned and constructed the Central Railroad of Haiti, of which he was president from 1909 to 1917. He was vice-president of the American International Corp. from 1916 to 1923, and of the Siems-Carey Railway and Canal Co. from 1921 to 1923. Since 1924 he had been secretary of the American Institute of Consulting Engineers. Mr. Henry was the author of numerous articles on highway engineering and other subjects, and had served as American delegate to several meetings of the International Congress of Road Builders.

Philip W. Henry

Alfred Chapin Gallagher (Assoc. M. '31) superintendent of the Turner Construction Co., New York City, died suddenly on Sep-

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tember 13. He was 55. Mr. Gallagher had been with the Turner Construction Co. since 1916, except for a two-year period of service in the Army Field Artillery during the first World War. He was superintendent in charge of building operations from 1922 on.

John George Hirsch (Assoc. M. '15) mechanical superintendent for the St. Joseph Lead Co., Bonne Terre, Mo., died there on November 9. Mr. Hirsch, who was 61, had been with the St. Joseph Lead Co. for the past 23 years. Before that he had been in the consulting office of Daniel W. Mead, Madison, Wis.; with the Stone & Webster Engineering Corp., Boston; and the Benham Engineering Co., Kansas City, Mo.

Andrew Kinghorn Johnson (M. '27) former Queens highway engineer, died at his home in St. Albans, Queens, on November 24, at the age of 65. Mr. Johnson retired in June 1946, after 40 years in the service of New York City. He was engaged on the construction of the Catskill Aqueduct from 1906 to 1914, and since the latter date had been in the Queens Highway Department—as chief engineer from 1928 until his retirement. Mr. Johnson was a past-president of the National Society of Professional Engineers and of the New York Society of Municipal Engineers.

John Knickerbacker (M. '00) of Troy, N.Y., died on June 16, 1947, though word of his death has just reached the Society. Mr. Knickerbacker, who was 81, spent his entire career with the Eddy Valve Co., of Waterford, N.Y. He was vice-president from 1887 to 1889, and since the latter date had been president.

Jonta Boen Marcellus (M. '21) former city engineer of Claremont, Calif., died at his home at Pomona, Calif., on November 13. Mr. Marcellus, who was 65, had been chief engineer for E. W. Marland, of Ponca City, Okla., and for 15 years was engineer-appraiser for the Federal Land Bank of Wichita, Kans. More recently he had represented the Kansas City engineering firm of Black & Veatch in California and had been city engineer of Claremont.

Charles Adam Mixer (M. '93) retired engineer of Rumford, Me., died on October 24. Mr. Mixer had spent most of his career with the Rumford Falls Power Co., having gone there as engineer many years ago. Later he became chief engineer, and for several years prior to his retirement in 1944 served the organization in the capacity of consulting engineer.

Archibald Whitfield Nance (Assoc. M. '17) of Pittsburgh, Pa., died suddenly at his home there on November 7. He was 60. A specialist in bridge design, Mr. Nance was a member of the Farris Engineering Co., of Pittsburgh, from 1910 until his retirement in 1940. Since the latter year he had been the engineer member of the Pennsylvania State Board of Health. He was prominent in Masonic activities, and a veteran of World War I.

Walter Samuel Olson (M. '40) director of the Division of Water Resources and Engineering of the Minnesota Department of Conservation, St. Paul, Minn., died in that city on October 15. Mr. Olson, who was 57, had been in the service of the state for more than 30 years.

Harry Nelson Pharr (M. '05) civil engineer and member of the Mississippi River Commission, Memphis, Tenn., died in Memphis on November 3, at the age of 72. An authority on flood control of the Mississippi River and its tributaries, Mr. Pharr served as chief engineer of the St. Francis Levee District of Arkansas from 1897 to 1907 and, again, from 1918 to 1935. At one time he was also chief engineer of the Crawford County Levee District of Arkansas. He had been a member of the Mississippi River Commission since 1935.

Harry N. Pharr

Arthur Graham Robbins (Affiliate '16) retired engineer of Winchester, Mass., died on October 26. Mr. Robbins, who was 85, was on the teaching staff of the Massachusetts Institute of Technology from the time of his graduation there, in 1886, until 1932. He retired in the latter year, with the rank of professor emeritus.

Naum Levi Shamroy (Assoc. M. '30) of Pittsburgh, Pa., died on October 11, at the age of 48. Mr. Shamroy had been with the late George F. Hardy, M. ASCE, of New York, on the design and construction of paper mills; designing draftsman for the Masonite Corp., at Laurel, Miss.; and chief draftsman for H. S. Ferguson & Co., of New York. More recently he was connected with the Rust Engineering Co., of Pittsburgh.

George Eber Stratton (M. '12) chief of the Construction Section of the U.S. Civil Aeronautics Administration, Washington, D.C., died there on November 8. His age was 74. Mr. Stratton had been an engineer for the Metropolitan Sewer Commission of Boston, Mass., and the War Department, and from 1903 to 1926 was in the U.S. Bureau of Reclamation. In 1927 he joined the U.S. Bureau of Air Commerce (now the Civil Aeronautics Administration) as engineer, later becoming chief of the Construction Section.

Edward Heer Stumpf (Assoc. M. '31) of Pittsburgh, Pa., died suddenly at his home there on November 25. Mr. Stumpf, who was 49, had been on the engineering staff of the City of Pittsburgh, in charge of surveys for street and sewer contruction. Later he was contract engineer for the Pennsylvania Department of Highways and district engineer and assistant chief engineer of the Eastern Region of the National Paving Brick Association, in charge of promotional work. During the recent war, Mr. Stumpf served as a lieutenant commander in the Navy.

Edward Ernest Russell Tratman (Assoc. M. '91) civil engineer of Wheaton, Ill., died on November 30, at the age of 84. Born and educated in England, Mr. Tratman came to the United States in 1884, later serving as special government agent to report on metal and wood railway ties. Author of many works on railroad engineering subjects, he received the Society's Norman Medal in 1888 for a paper on English railway track. From 1886 to 1932 he was on the editorial staff of the *Engineering News-Record*. Mr. Tratman was fourth on the list of veteran Society members, having joined the ASCE as a Junior in 1886.

Minton Machado Warren (M. '20) construction engineer of Cambridge, Mass., died in New York City on November 4. Mr. Warren had been with Stone & Webster, of Boston, on a wide variety of construction work in this country and Cuba. While serving overseas in the first World War, he organized the first American Topographic Section and, after the armistice, was in charge of the repair and reconstruction of 500 miles of French roads. Later Mr. Warren organized and directed several aircraft corporations, and more recently he was director of research for Jackson & Curtis, of New York City.

Grass Stabilizes Sand at New York's Idlewild Airport

(*Continued from page 35*)

Experience with both these seashore grasses shows that beach grass is more readily adapted to machine planting methods since the plants contain less trash and therefore pass through the machine without serious clogging, thus making it unnecessary to sacrifice the upper portion of the plant. An area planted with beach grass with the specified number of plants per acre results in raising the level of the wind to the tips of the mass of grass, about 18 in., thereby practically eliminating the shifting of sand.

Poverty grass plants, on the other hand, contain more trash, and must be cleaned more thoroughly. Also the stems are brittle and must be chopped off to about 8 in. above the ground before they will pass through the machine. As a result the planting of poverty grass alone will not deflect the wind high enough above the ground surface to prevent the shifting of sand.

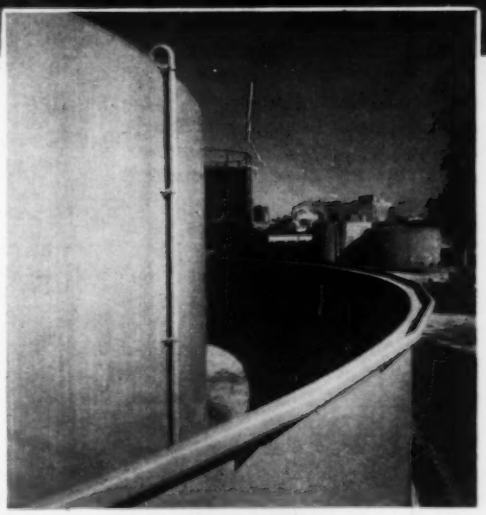
Poverty grass seeds readily, and in this manner tends to spread rapidly over an area. Beach grass, however, very rarely produces viable seed. The planting of a combination of not over 10 percent of poverty grass with 90 percent of beach grass will produce a more satisfactory and rapid permanent cover than a planting of beach grass exclusively. It is this combination method which is being followed at New York International Airport.

This extensive program of sand stabilization has progressed with the advice of specialists of the Long Island State Park Commission who

STANDBY GAS PLANT USES HORTON STEEL TANK for OIL STORAGE

The Hartford Gas Company at Hartford, Conn., obtains its main supply of gas from New Haven, 35 miles away. The local plant at Hartford serves as a standby or peak load plant. It operates about 10 months out of the year and produces up to 10,000 mcf of water gas per day. Oil used in producing the water gas is stored in steel storage tanks. The above photo shows the 100-ft. diam. by 40-ft. high Horton tank and the 140-ft. diam. by 20-ft. steel fire wall we recently erected for this gas company. With the addition of the new tank, total storage capacity at the plant is now 3,200,000 gals. The Hartford Gas Company serves approximately 63,000 customers. Sendout varieties from 7,000 mcf per day in July to 15,000 mcf per day during mid-winter.

In addition to flat-bottom steel storage tanks, we build various types of pressure storage tanks and elevated water tanks. Engineers responsible for furnishing this kind of equipment to industry are invited to write our nearest office for estimating costs.



This view shows a close-up of the steel fire wall. This type of wall was used because of limited ground space and condition of the sub-soil.

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have gained experience in this work over many years in the development, reclamation and stabilization of the Long Island beaches. Contracts at New York Airport have been completed covering 3,200 acres of beach grass planting. Bids under various contracts ranged from $125 to $210 per acre.

It should be observed that until all construction work at New York International Airport is completed, there is bound to be some blowing sand from open excavations, grading operations and other soil disturbances. The only remedy is constant and continuous planting and replanting. Complete success can be expected, however, only when the last construction operation has been finished.

Deep Caisson Piers Support New Memphis Highway Bridge

(*Continued from page 25*)

to concrete anchors weighing 40 to 50 tons each.

Preparation of the site for sinking the two deep-water piers included dredging and the placing of a 250× 300 ft willow mat over the mud river bottom. Pouring of concrete in the steel caissons forced the cutting edges of the caissons through the wood mat and rock riprap with which the mat was sunk, aided by a specially-built cutting tool plunged along side of the caisson. When the caissons had been sunk to refusal by open dredging, operations were continued by pneumatic methods. Air pressures as high as 45 lb were required.

The smaller reinforced concrete Arkansas approach piers are founded on concrete piles as is the Memphis abutment. Merritt-Chapman & Scott, New York contractors who built the seven main piers, are also constructing the Arkansas approach structure. Harris Structural Steel Co. of New York has been awarded the contract for the main bridge superstructure.

Uruguay's Rincon del Bonete Project Supplies Hydro Power

(*Continued from page 30*)

units, the use of critical materials was decreased to 60 percent. In preference to 6.6 kv and three-winding transformers as specified by the Germans, a generating voltage of 13.8 kv and two-winding transformers were chosen. Local service is to be obtained by stepping down from the 13.8-kv bus instead of from the extra transformer winding. Protection of the transmission line is accomplished by double overhead ground wires and by additional use of shielding wires on substation structures. Lightning arresters are mounted on the transformers for maximum protection. Two 20,000-kva, synchronous condensers will be installed at the north substation. These synchronous condensers will be supplied by Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Hydro power at the steam-plant substation is synchronized with the steam plants which are rated at 90,000 kw. For the past four years this rating has been greatly reduced through the deterioration of equipment caused by the unavoidable and prolonged use of poor fuels, such as sunflower seed, corn, and Brazilian coal(with 30 percent or more ash); because of the impossibility of taking equipment out of service for a sufficient length of time to perform needed repairs, before the hydro plant was in operation; and because of the lack of spare parts.

The machinery and equipment for the third and fourth hydro units, the second transmission line and associated substation equipment, are now being installed. Part of the machinery and equipment is still under construction in the United States. The first hydro unit has been in operation since December 21, 1945, and the second one since February 1947. The third unit will be in operation in March 1948, and the fourth will be ready at the end of 1948. The whole system, including all the Montevideo substations and the synchronous condensers, will be finished at the beginning of 1950.

Arch Roof Construction Provides Column-Free Area

(*Continued from page 31*)

porting structure. The shell reinforcing consists primarily of two layers of welded wire mesh with additional reinforcing placed at critical points. To obtain maximum efficiency in the use of both labor and falsework, high early strength cement, poured in a continuous operation, was used for the main and small roofs on each side.

Falsework provided with wheels and mounted on rails was built for one unit. When sufficient time had elapsed after making a pour, the falsework was lowered an inch or two by means of screw jacks and rolled into position for succeeding adjacent units. Expansion joint material was placed between adjacent units and metal flashing was placed over the joint to render it weatherproof.

Designed by the Bureau of Architecture of New York City, Department of Public Works (at that time under the direction of A. Gordon Lorimer and now under A. J. Daidone), the building was erected by the Corbetta Construction Co. of New York City. Roberts and Schaefer Co. of Chicago served as engineers.

Rock Riprap Slope Protection at Santee-Cooper Project

(*Continued from page 18*)

The work involves the breaking up of 400,000 sq yd of porous concrete and quarrying, transporting and placing 330,000 cu yd of solid rock. Porous concrete is being broken by a specially designed pavement breaker mounted on a truck chassis, operated by compressed air both above and below water, as shown in accompanying photographs. Rock is being quarried near the Congaree River above the headwaters of the Santee Reservoir, transported by barges and LCT's to the site, where placement is by clamshell cranes mounted on barges.

Recent inspection of the condition of the porous concrete has confirmed the opinion that a wise decision was made when rock riprap on a rock filter layer was selected as the final slope-protection material.

Harza Engineering Co. was consulting engineer for the entire project for the South Carolina Public Service Authority, while Malcolm Pirnie, Past-President ASCE, served in a similar capacity for the Federal Works Agency for the new slope-protection project. J. H. Moore is chief engineer for the Authority. C. L. Vickers is project engineer for the Federal Works Agency. E. R. de Luccia, M. ASCE, and W. R. Farley, Assoc. M. ASCE, represented the Federal Power Commission with H. W. Steele, Assoc. M. ASCE, as consultant for the Corps of Engineers. The Board of Consulting Engineers was composed of W. H. McAlpine, Andrew Weiss, R. R. Proctor and S. O. Harper, Members ASCE.

Investigation of the slope-protection damage was initiated in 1944 by Col. William N. Carey, now Executive Secretary, ASCE, then chief engineer, Federal Works Agency. The writer has been connected with the supervision of the project for the Office of the Administrator and for the Bureau of Community Facilities, Federal Works Agency, since 1944.

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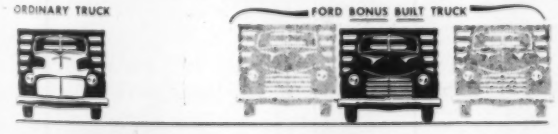

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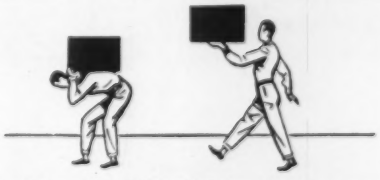

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AIR CONDITIONING. By Herbert Herkimer and Harold Herkimer. Chemical Publishing Co., Brooklyn, N.Y. (26 Court Street), 1947. 720 pp., illus., tables, diagrs., charts, 8½×5½ in., cloth, $12. A useful book for engineers and others engaged in the expanding field of air conditioning. The object of the book is to provide all the required information on every phase of the subject—estimation, sales, production, installation, supervision, service, etc. It reviews the laws of chemistry and physics involved in air conditioning, and then goes on to the practical aspects of the industry.

CALIFORNIA GOLD, THE BEGINNING OF MINING IN THE FAR WEST. By R. W. Paul. Harvard University Press, Cambridge, Mass., 1947. 380 pp., illus., tables, 8¾×5¾ in., cloth, $4.50. The beginning of mining in the Far West is described in this study of the period between Marshall's discovery of gold in 1848 and 1873. Well documented, the book covers not only the cycles of boom and decline in the gold fields but also the story of the economic and financial activities which provided the foundation for the development of the West. The work and life of the ordinary gold miner are described, including contemporary illustrations.

EXPOSITION, TECHNICAL AND POPULAR, edited by J. R. Gould and S. P. Olmsted. Longmans, Green and Co., New York, London, Toronto, 1947. 126 pp., diagrs., tables, 8¼×5½ in., cloth, $1.75. Using the term "exposition" to mean the type of writing of which the basic function is to inform, this book describes writing techniques for the man with a technical background as well as for the general reader. The material is presented in three sections. The first analyzes the various types of exposition and includes models extending from the simple to the complex, and from the technical to the popular. The research article is handled in section two. Attention is directed to methods of research, systems of note taking, and the preparation of footnotes and bibliography. The third section shows the devices which may be used in the adaptation of specialized material for the lay audience.

GLACIAL GEOLOGY AND THE PLEISTOCENE EPOCH. By R. F. Flint. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 589 pp., illus., diagrs., maps, tables, 9¼×5¾ in., cloth, $6. This book presents a compact reconstruction of the history of the Glacial epoch for geologists, ecologists, archeologists, geographers and others interested in the prehistoric realm. Giving a wealth of detailed descriptive material, it constitutes a reference to data already compiled and indicates the areas in which further research is needed. Correlations of Pleistocene strata, and other broad general conclusions based on geologic evidence are presented. Some 800 literature references are listed covering a wide range, but important titles from various countries during the war years may be lacking.

INDUSTRIAL MANAGEMENT, 4 ed. By W. R. Spriegel and R. H. Lansburgh. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 656 pp., illus., diagrs., charts, tables, 9¼×5¾ in., cloth, $5. Policies and principles of successful management are presented, with the devices necessary for carrying them out, keeping in mind the needs both of the college student and the executive. Throughout the book an effort has been made to show the interdependence of the various major departments of a business. The fourth edition has been thoroughly revised to cover the recent developments in the field, and includes as new material a chapter on maintenance. There is a broadly classified bibliography

SPECIFICATIONS FOR STEEL RAILWAY BRIDGES FOR FIXED SPANS NOT EXCEEDING 400 FT IN LENGTH. American Railway Engineering Association, 3 East Van Buren St., Chicago 5, Ill., 1947. 6 pp., diagrs., tables, 9×6 in., paper, $0.50. The specifications are for steel railway bridges with fixed spans not exceeding 400 ft in length. Part I, giving details of design and manufacture includes proposals, drawings and weighing and shipping information. Parts II and III cover the various types of steel for structural and rivet use giving chemical and physical properties and certain information concerning alloy steels not appropriate as specification clauses.

WATKINS CYCLOPEDIA OF THE STEEL INDUSTRY, ed. Steel Publications, Inc., Pittsburgh (Smithfield St.), 1947. 375 pp., plus 93 pp. directory and advertisers' index, illus., diagrs., tables, 11½ × 8¼ in., cloth, $10. This book describes briefly modern procedures required for performing operations employed in the manufacture of steel from the treating of iron ores to the handling of the finished product. Such processes as beneficiation, nodulizing, and sintering are discussed. The blast furnace, the open hearth furnace, the bessemer converter, the electric furnace, and the cupola are dealt with. Rolling and shaping of steel, forging and welding of steel, metal finishing and cleaning, and the inspection and testing of steel are mentioned.

WIND-TUNNEL TESTING. By A. Pope. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 319 pp., illus., diagrs., charts, tables, 8½×5½ in., cloth, $5. This volume presents an analysis and study of the extensive but scattered technical information published on the subject. The topics covered are design and general consideration of tunnels, testing procedures with scale-model aircraft, extrapolation to full scale and wind-tunnel-boundary corrections. The design of a propeller-flow straightener system is treated. An appendix discusses the construction of a wind-tunnel model. A list of references is given at the end of each chapter.

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APPLICATIONS FOR ADMISSION OR TRANSFER

January 1, 1948 — Number 1

The Constitution provides that the Board of Direction shall elect or reject all applicants for admission or for transfer. In order to determine justly the eligibility of each candidate, the Board must depend largely upon the membership for information.

Every Member is urged, therefore, to scan carefully the list of candidates published each month in CIVIL ENGINEERING *and to furnish the Board with data which may aid it in determining the eligibility of any applicant.*

It is especially urged that a definite recommendation as to the proper grading be given in each case, inasmuch as the grading must be based upon the opinions of those who know the applicant personally as well as upon the nature and extent of his professional experience. Any facts derogatory to the personal character or professional reputation of an applicant should be promptly communicated to the Board. Communications relating to applicants are considered strictly confidential.

The Board of Direction will not consider the applications herein contained from residents of North America until the expiration of 30 days, and from non-residents of North America until the expiration of 90 days from the date of this list.

MINIMUM REQUIREMENTS FOR ADMISSION

GRADE	GENERAL REQUIREMENT	AGE	LENGTH OF ACTIVE PRACTICE	RESPONSIBLE CHARGE OF WORK
Member	Qualified to design as well as to direct important work	35 years	12 years	5 years
Associate Member	Qualified to direct work	27 years	8 years	1 year
Junior	Qualified for subprofessional work	20 years	4 years	
Affiliate	Qualified by scientific acquirements or practical experience to cooperate with engineers	35 years	12 years	5 years

APPLYING FOR MEMBER

BERNAT, HARRY JACOB (Assoc. M.) (Age 39) Chf. Constr. Engr., Kaiser-Frazier Corp., Ypsilanti, Mich.

BISHT, MADHAB SINGH (Age 45) Superintending Engr., PWD, Lucknow, United Provinces, India.

BOYCE, FRANK FAIRBROTHER (Age 46) Staff Engr., DeLeuw, Cather & Co.; Project Engr., Toronto Transportation Comm., Toronto, Canada.

CANAN, HOWARD VOORHEIS (Age 53) Dist. Engr., Nashville Dist., Corps of Engrs., Nashville, Tenn.

CARLSON, PAUL NELS (Age 62) Contr. & Engr. (private practice), Seattle, Wash.

DODGE, ALEXANDER (Assoc. M.) (Age 48) Senior Engr., U. S. Engrs., Head, Structural Subsec., Portland, Ore.

DOWE, DONALD HOLT (Age 46) Asst. Engr. of Bridges, Seaboard Air Line R.R., Norfolk, Va.

DRUMMOND, CHARLES EDGERTON, JR. (Age 49) With Wiedeman & Singleton, Engrs., Atlanta, Ga.

DUNN, BEVERLY CHARLES (Assoc. M.) (Age 59) Div. Engr., North Atlantic Div., Corps of Engrs., New York City.

DVORAK, JOHN JERRY (Jun.) (Age 35) Chf. Draftsman, Humble Oil & Refining Co., Baytown, Tex.

ELMES, WILLIAM THOMAS (Age 43) Research Engr., Pittsburgh & Lake Eire R.R., Pittsburgh, Pa.

FORBES, F. POWELL (Age 39) Mgr.-Engr., Sales and Fabrication Div., Weyerhaeuser Timber Co., Newark, N. J.

HELMKAMPF, AUGUST FREDERICK (Age 39) Vice-Pres., Pitzmans Co. of Surveyors and Engrs., St. Louis, Mo.

HOAR, VICTOR MYERS (Assoc. M.) (Age 41) Chf. Engr., Public Stockton Annex, Stockton Army (NS CO), Stockton, Calif.

KNIGHT, MERRILL DONALDSON (Assoc. M.) (Age 48) Highway Engr., Urban Roads Div., Public FWA, Washington, D.C.

LIGGETT, WILLIAM HENRY (Age 37) Instructor, Northrop Aeronautical Inst., Redondo Beach, Calif.

(Continued on page 86)

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Industrial Power

(*Continued from page 82*)

MILLING, MARTIN ALEXANDER (Age 45) Cons. Engr., Anderson, Ind.

MOORE, RAYMOND LEROY (Assoc. M.) (Age 44) Private practice, Chattanooga, Tenn.

MORTON, ROY JAY (Age 50) Associate Prof. of Preventive Medicine and Public Health, Vanderbilt Univ. School of Medicine, Nashville, Tenn.

MORY, SAMUEL ALBERT, JR. (Age 45) Prof. of Structural Eng., Univ. of Kentucky, Lexington, Ky.

PORTER, CARROLL BENJAMIN (Age 43) Asst. Chf. Engr., Chesapeake & Ohio Ry. Co., Richmond, Va.

RAJOGOPALAN, DURAISWAMY AYYANGAR (Age 45) Engr., PWD, Madras, India, Triplicane, South India.

RICHTER, VICTOR JOHN (Assoc. M.) (Age 44) Cons. Engr. (private practice), Silver Spring, Md.

RIESBOL, HERBERT SPENCER (Assoc. M.) (Age 39) Prin. Hydr. Engr. and Asst. Chf., Hydrology Div., Branch of Project Planning, Bureau of Reclamation, Denver, Colo.

ROE, OLE S. (Age 51) Chf. Structural Eng., W. J. Knight & Co., St. Louis, Mo.

TAYLOR, SAMUEL HERBERT, JR. (Age 46) County Engr., Camden County, Camden, N.J.

THOMPSON, VERLIN GLENN (Assoc. M.) (Age 49) Co-partner and Chf. Engr., Hudgins, Thompson, Ball & Associates, Oklahoma City, Okla.

THORNBURG, MAX WESTON (Age 55) Consultant on industrial affairs with foreign governments and private interests, UMM A'Sabaan Island Bahrain, Persian Gulf.

TSAI, FANG-YIN (Age 46) Prof. and Head of Dept. of Civ. Eng., National Chung Cheng Univ., also Adviser and Senior Tech. Expert CNRRA, Regional Office, Nanchang, Kiangsi, China.

WHIPPLE, HORTON (Assoc. M.) (Age 54) Member of firm, Thomas & Whipple, Cons. Engrs., Palo Alto, Calif.

WILLEY, WILLIAM EDWARD (Age 36) Engr., Div. of Economics and Statistics, Arizona Highway Planning Survey, Phoenix, Ariz.

WILLIAMS, CLINTON EARL (Age 40) Asst. Prof., Eng. Dept , Mohawk Coll., Utica, N.Y.

WOOD, ROBERT HART (Assoc. M.) (Age 37) Asst. Chf. Engr., Hazelet & Erdal, Cons. Engrs., Louisville, Ky.

APPLYING FOR ASSOCIATE MEMBER

ARBUTHNOT, GUY LANE, JR., (Age 36) Chf., Model Appurtenances Sec., Mississippi Basin Model Branch, Waterways Experiment Station, Clinton, Miss.

BEATTY, JAMES LAUGHEAD (Age 54) Associate Physical Testing Engr., Materials & Research Dept., California Div. of Highways, Sacramento, Calif.

BENISH, ANTHONY ANDREW (Age 44) Asst. Prof. of Civ. Eng., Univ. of Texas, Austin, Tex.

BICKERSTAFF, RAYMOND MAYHEW (Jun.) (Age 34) Vice-Pres., Tramrail Eng., Inc., Oakland, Calif.

BLEISTEIN, FRANK EDWARD (Age 32) Jun. Designer, Howard, Needles, Tammen & Bergendoff, Cons. Engrs., Kansas City, Mo.

BOLZER, MORRIS SAMUEL (Jun.) (Age 30) Engr. with Dist. Engr., Ancon, Canal Zone; Frazier Park, Calif.

COURLAND, RAPHAEL HIRSCH (Age 30) Civ. Engr., Maurice Courland & Son, New York City.

DUSZYNSKI, EDWIN JAMES (Jun.) (Age 34) Structural Engr., DPW, Bureau of Bridges & Public Bldgs., Milwaukee, Wis.

DUTTON, CECIL SYDNEY (Age 31) Senior Asst., Babties, Shaw & Mortor, Cons. Civ. Engrs., Glasgow, Scotland.

EEDS, WALTER LEARY (Jun.) (Age 35) With Freese & Nichols, Ft. Worth, Tex.

FOSTER, RUSSELL LAVERN (Age 33) Asst. to Gen. Mgr., Tucker McClure, Engr.-Contr., Balboa, C.Z.

FULLANA-SERRA, JAIME (Age 30) Chf. Engr., Long Constr. Co., San Juan, Puerto Rico.

GUPTA, SACHINDRA NATH (Age 40) On deputation from India for study and training in highway engineering; graduate student, Univ. of Utah, Ft. Douglas, Utah; permanent address, Calcutta, India.

HALL, HARRY A. (Age 36) Engr., Design Branch, Mississippi River Comm., Corps of Engrs., Vicksburg, Miss.; Asst. to Project Engr., Memphis Flood Control, Vicksburg, Miss.

HAMMES, KENNETH WILLIAM (Jun.) (Age 35) Hammes Eng. Co., Globe, Ariz.

HANSON, ARCHIE JAMES (Jun.) (Age 35) Asst. Engr., U.S. Geological Survey, Oklahoma City, Okla.

HARNED, CHARLES HAL (Age 37) Senior Eng. Geologist, California Div. of Highways, Sacramento Calif.

HARTLEY, GEORGE DANIEL (Age 40) Gen. Supt., Doyle & Russell, Gen. Contrs., Richmond, Va.

HEDIN, WILLIAM NELS (Jun.) (Age 35) Constr. Engr. with Nels Hedin, Gen. Contr., Seattle, Wash.

HENRY, JAMES MILLS (Age 30) Asst. Civ. Engr., Municipal Office, Myrtella, Milnathort, Kinross-Shire, Scotland.

HOLBROOK, ALBERT ELISHA (Age 35) Research Associate, American Iron & Steel Co., Washington, D.C.

JONES, FRANK DUDDLEY (Age 45) Asst. Mech. Engr., Mech. Sec., TVA, Knoxville, Tenn.

KINCAID, ANDREW TED (Age 60) Engr. Aide V, Los Angeles County Eng. Dept., Sanitation and Storm Drain Div., Los Angeles, Calif.

LAURGAARD, GLENN OLAF (Jun.) (Age 35) Engr., U.S. Bureau of Roads, Region II, Sacramento, Calif.

LEY, ROGER DELMORE (Jun.) (Age 34) Asst. Hydr. Engr., Western Massachusetts Elec. Co., Turners Falls, Mass.

LIEBSCHER, ARTHUR FRANCIS (Jun.) (Age 34) Civ. Engr., Basalt Rock Co., Napa, Calif.

LYMAN, ROBERT JOSEPH (Jun.) (Age 30) Engr., Asst. to Design Chf., Eng. Div., Albuquerque Dist., Corps of Engrs., Albuquerque, N.Mex.

MADDEN, EDWARD BINGHAM (Jun.) (Age 35) Hydr. Engr., Corps of Engrs., Little Rock, Ark.; Asst. Head of Hydrology Sec., Little Rock, Ark.

MAFFETT, LLOYD (Age 53) Gen. Eng. Practice, Florence, Ala.

MOULTON, JOHN JESSE (Jun.) (Age 34) Chf. Structural Engr., George A. Fuller Co., Parkway Village job, St. Albans, N.Y.

MUTZ, JOHN LAWRENCE (Age 40) Area Engr., Bureau of Reclamation, Albuquerque, N.Mex.

NASCA, STEVE ANTHONY (Age 33) Bridge Designer, Louisiana Dept. of Highways, Baton Rouge, La.

NELSON, HAROLD EASTON (Age 30) Lt.-Col., TAC, SEC, T.I.S., U.S. Army, Ft. Benning, Ga.

PETERS, MICHAEL ANTHONY (Age 30), Hydr. Engr., Federal Power Comm., New York City.

PORATH, ARTHUR ALBERT (Age 50) Member of firm, Foth & Porath, Inc., Cons. Engrs.; also City Engr., De Pere, Wis.

PRAY, FRANCIS ELLARD (Jun) (Age 33) Asst. Civ. Engr., Project Planning Div., TVA, Knoxville, Tenn.

RAVIOLA, REMO (Age 36) Civil and Structural Engr., U.S. Engr. Office, Baltimore, Md.

ROGER, CHARLES STEPHEN, JR. (Age 34) Office Engr., Engr. Div., Albuquerque Dist., Corps of Engrs., Albuquerque, N.Mex.

SELEME-VARGAS, FELIPE (Age 28) Designing Engr., Howard R. Green Co., Cons. Engrs., Cedar Rapids, Iowa.

SANDERS, ERIK KING (Age 27) Supt., Sanders Eng. Co., Portland, Me.

SCOTT, PHILIP ROY (Age 34) Associate, Gutteridge, Haskins & Davey, Melbourne, Australia.

SMYTH, WILLIAM LOWRY, (Age 50) Member of firm, Sheftall & Bryson, Philadelphia, Pa.

SYLVESTER, JACK (Jun.) (Age 38) Jun. Bridge Engr., California Dept. of Public Works, Div. of Highways; Asst. Bridge Engr., South Pasadena, Calif.

VISWANATH AYYAR, NEMALI (Age 46) Instructor in Hydr. Eng., Coll. of Eng., Guindy, Madras, India.

WEST, AMBROSE RANDALL (Age 44) Asst. Dist. Engr., Pennsylvania Dept. of Highways, Allentown, Pa.

WITTE, HERBERT WALTER (Jun.) (Age 35) Res. Engr., Dewey Reservoir Project, Corps of Engrs., Paintsville, Ky.

YATES, FRANCIS GORDON (Jun.) (Age 30) Associate Civ. Engr., City Engrs. Office, Santa Rosa, Calif.

APPLYING FOR JUNIOR

BAINES, WILLIAM DOUGLAS (Age 21) Research Asst., Iowa Inst. of Hydraulic Research, State Univ. of Iowa, Iowa City, Iowa.

BAYLISS, JOHN ROBINSON (Age 27) Graduate Student, Princeton Univ., Princeton, N.J.

ELLINGTON, CLYDE LEONARD (Age 25) Project Inspector, Virginia Dept. of Highways, Hampton, Va.

ERTEN, SALIH ADNAN (Age 22) 1947 B.S.C.E., Robert Coll., Istanbul, Turkey; at present graduate student, Univ. of Illinois, Champaign, Ill.

FREDERICK, DANIEL (Age 22) Graduate student; Virginia Polytechnic Inst., Blacksburg, Va.

KOSTOFF, JIMMY (Age 25) Civ. Engr., U.S. Bureau of Reclamation, Trenton, Utah.

LANGLOIS, JOHN WETHERALL (Age 23) Design Engr. with Gordon Wallace, Cons. Structural Engr., Toronto, Canada.

MARTINEZ, MILTON RAFAEL (Age 23) Graduate Student, Cornell Univ., Ithaca, N.Y.

MULLER, WERNER HERZ (Age 27) Asst. Engr., Inst. Nacional de Obra Sanitarias, Urbinization Los Caobos, Avenida la Colina, Quinta Glorieta.

POST, GEORGE RAOUL (Age 24) Student, Chf. Engr's. Office, TVA, Knoxville, Tenn.

SEAMANS, DOUGLAS CAMPBELL (Age 26) Designing Engr., Humble Oil & Refining Co., Baytown, Tex.

SHINA, ISAAC S. (Age 21) 1947 B.S.C.E., American Univ. of Beirut, Lebanon; at present graduate student, Univ. of Michigan, Ann Arbor, Mich.

SNEATH, NORMAN (Age 21) Postgraduate student in civil structures, Cambridge Univ., Cambridge, England.

ULGEN, ASAF AYHAN (Age 25) 1946 M.S. in Hydr. Eng. Istanbul Tech. Univ.; at present graduate student, Columbia Univ., New York City.

WEEKS, ROBERT KENNETH (Age 24) Asst. Engr., Frederic R. Harris Eng. Corp., Knoxville, Tenn.

WEBB, JOSEPH BAXTER (Age 31) With Kimberly Clarke Corp., Industrial Eng., Neenah, Wis.

WESTLING, ARNOLD MARCUS (Age 26) Planning and public works consultant, Bureau of Municipal Research and Service, Univ. of Oregon, Eugene, Ore.

WHIDDEN, FRANCIS EUGENE (Age 31) With Structural Eng. Dept., Libby-Owens-Ford Co., Toledo, Ohio.

ALA. POL. INST.

	Age
WADE, GERALD WEAR, 1947	(20)

BROOKLYN POL. INST.

SHERWANI, ABDUL JABBER, 1947	(24)

CARNEGIE INST. TECH.

DANIELS, STUART RUSSELL, 1947	(21)
MCDERMOTT, JOHN FRANCIS, 1947	(21)
PYZDROWSKI, HENRY ANTHONY, 1947	(25)
SAUK, FRANK ANTHONY, 1947	(23)

COLL. OF CITY OF N.Y.

KANE, HARRISON, 1947	(22)

GA. SCHOOL TECH.

SOMERS, WILLIAM COITE, JR., 1947	(23)

UNIV. OF ILL.

BEDFORD, JOHN GLENNON, 1947	(27)
HALSEY, JAMES FREDERIC, 1947	(27)
KIMBROUGH, MAURICE LEROY, 1947	(22)
RASTRELLI, LEONARD U., 1947	(25)
ROBINSON, BERNARD LEO, 1947	(23)
SLINKMAN, GEORGIA EVELYN, 1947	(25)

IOWA STATE COLL.

GAGNON, CLARE JOSEPH, 1947	(26)
PRIDE, RICHARD ALLEN, 1947	(25)

JOHNS HOPKINS UNIV.

PASS, RALPH PATRICK, JR., 1947	(23)

MANHATTAN COLL.

VALENZIANO, FRANK PHILIP, 1945	(23)

UNIV. OF MINN.

MILLER, RALPH EDWARD, JR., 1947	(24)

NORTHWESTERN TECH. INST.

BRADAKIS, HENRY LEON, 1947	(26)

UNIV. OF NOTRE DAME

MUELLER, EDWARD ALBERT, 1947	(24)

UNIV. OF TENN.

HICKS, PAUL GRANT, 1947	(27)

UNIV. OF TEX.

WILSON, LUCY, 1947	(21)

UNIV. OF TOLEDO

LANG GILBERT DEFOREST, 1947	(25)

UTAH STATE COLL.

BLASER, HAROLD DEAN, 1947	(24)

UNIV. OF UTAH

BLUMER, HOWARD DILLMAN, 1947	(30)

UNIV. OF VERMONT

CARVER, CHARLES ELLSWORTH, JR., 1947	(25)

VA. MIL. INST.

JONES, JOSEPH REDFERN, JR., 1947	(25)

The Board of Direction will consider the applications in this list not less than thirty days after the date of issue.

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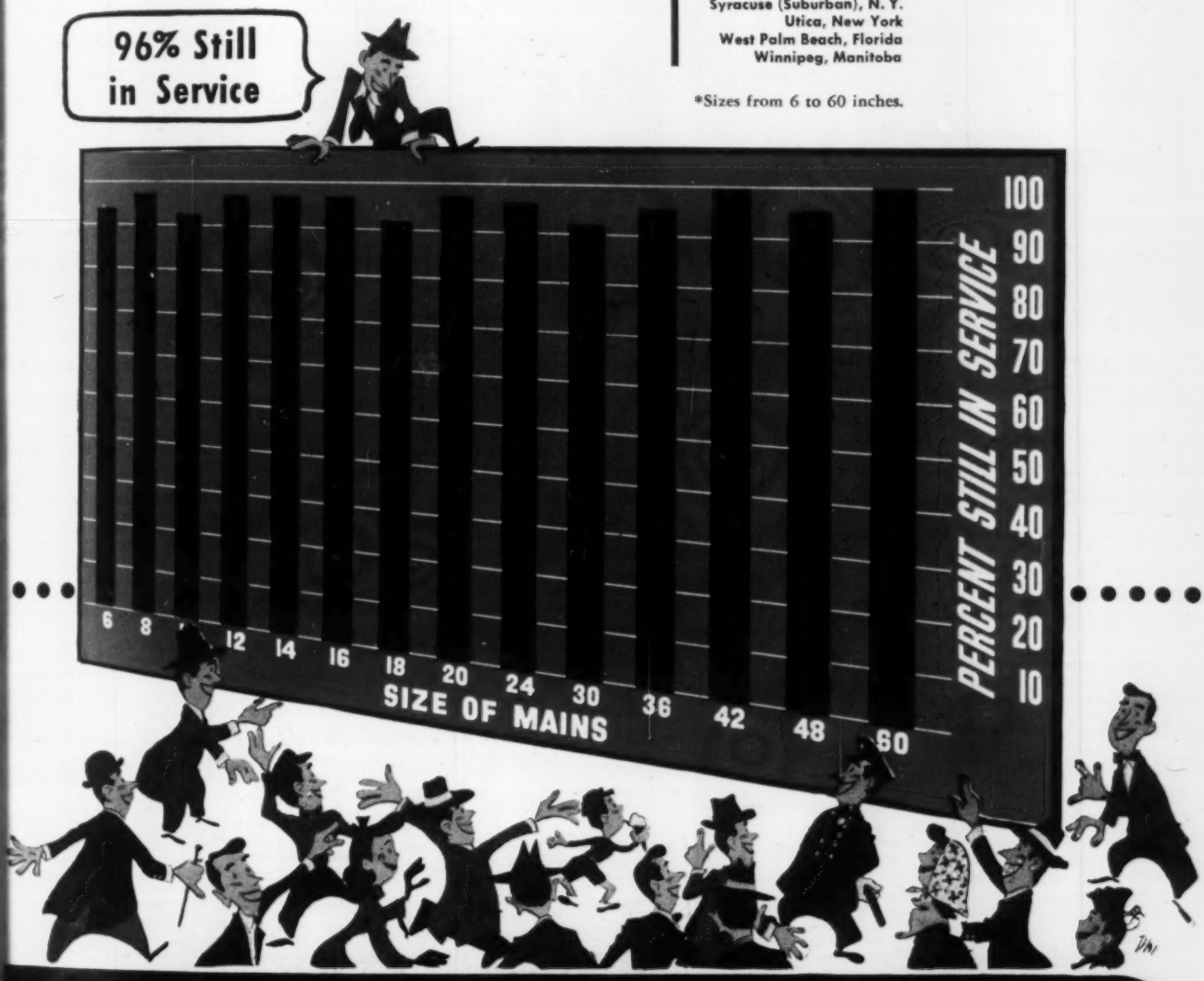

SERVES FOR CENTURIES

CHANGES IN MEMBERSHIP GRADES

ADDITIONS, TRANSFERS, REINSTATEMENTS, AND RESIGNATIONS

(From November 10 to December 9, 1947)

Additions to Membership

ALLISON, WENDELL GLEN (Jun. '47) Graduate Asst., Civ. Eng Dept., Univ. of Wyoming (Res., 615 South 10th St.), Laramie, Wyo.

AMES, LAWRENCE COFFIN, JR. (Jun. '47) Laboratory Asst., Chrysler Corp., 6501 Harper (Res., 111 East Kirby), Detroit 2, Mich.

AMORY, WALTER (Jun. '47) Structural Designer, Jackson and Moreland, 31 St. James Ave., Boston (Res., 131 Washington St., Brighton), Mass.

ANDERSON, LORN E. (Jun. '47) Draftsman, Birch-Johnson-Lytle "Alaska Constructors," B-J-L Sub Station 1 (Res., Box 715), Anchorage, Alaska.

ANDERSON, ROBERT EDWARD (Jun. '47) Graduate Teaching Asst., Purdue Univ., Heavilon Hall, Lafayette, Ind.

ANTENEN, JAY FREDERICK (Jun. '47) Structural Engr., Antenen Eng. Co., East Ave. and Hanover St. (Res., 228 North 7th St.), Hamilton, Ohio.

ARENZ, RICHARD MOORE (June. '47) Junior Highway Engr., Public Roads Administration, Box 3900, Portland (Res., 403 Kings Rd., Corvallis), Ore.

AYERS, MAURICE THURBER (Assoc. M. '47) Associate Prof. of Gen. Eng., Rutgers Univ., New Brunswick, N.J.

AYLING, ALBERT WALTER, JR. (Jun. '47) Junior Engr., Bechtel Corp., 220 Montgomery St., San Francisco (Res., Box 494, Marin City), Calif.

BATCHELDER, FRANCIS JOSEPH (Jun. '47) Engr., C. W. Lauman & Co., Inc., 50 Church St., New York 7, N.Y.

BATMAN, WENDELL FRANCIS (Jun. '47) Detailer, American Bridge Co. (Res., 217 Chase St.), Gary, Ind.

BAULSIR, CHARLES PALMER (M. '47) Associate, H. W. Lochner & Co., 150 North Wacker Drive (Res., 6900 South Crandon Ave.), Chicago 49, Ill.

BEAR, JOSEPH THOMAS, JR., (Jun. '47) Junior Engr., Smith Hinchman & Grylls, Inc., 800 Marquette Bldg., Detroit (Res., 1261 Bishop Road, Grosse Pointe Park 30), Mich.

BECK, LAWRENCE THOMAS (M. '47) Pres., Laurence T. Beck and Associates, Inc., Suite 908, 250 Park Ave., New York, N.Y.

BENNETT, DUDLEY EARL (Jun. '47) Junior Civ. Engr., State Highway Dept., 247 Third St., San Bernardino (Res., 3706 Taft St., Arlington), Calif.

BERRY, SAMUEL CARLYLE (Jun. '47) Asst. Instr. in Civ. Eng., Univ. of Missouri, 141 Eng. Bldg., Columbia (Res., Brunswick), Mo.

BERTRAND, ROBERT LOVE (Assoc. M. '47) Supervisor, Bldgs. and Grounds Unit, Veterans Administration, Branch Office 10, 1114 Commerce St. (Res., 3537 Asbury), Dallas, Tex.

BOEHL, ELMO WILLIAM (Assoc. M. '47) Civ. Engr., Process Engineers, Inc., 2409 Ross Ave. (Res., 2821 Rosedale Ave.), Dallas 5, Tex.

BOETTCHER, ARNOLD AUGUST (Assoc. M. '47) Engr., Dept. of Interior, Bureau of Reclamation (Res., 3007 Erie St., S.E.), Washington 20, D.C.

BOSWELL, JOSEPH IRA (M. '47) Engr., Vicksburg Dist., Corps of Engrs., Dept. of the Army, P.O. Box 60 (Res., 3511 Oak St.), Vicksburg, Miss.

BRANDT, PAUL CARL HENRY (Jun. '47) Graduate Student and Instr., Dept. of Architecture, Univ. of Illinois, Champaign, Ill. Res., 1158 Linden St., Indianapolis, Ind.)

BREININ, LAWRENCE JOSHUA (Jun. '47) 1645½ North Kenmore, Los Angeles 27, Calif.

BREVDY, JUNE (MISS) (Jun. '47) Research Asst. and Graduate Student, St. Anthony Falls Hydr. Laboratory, Univ. of Minnesota, Hennepin Island (Res., 305E Comstock Hall), Minneapolis, Minn.

BRITE, HECTOR LEIGH (M. '47) Industrial Specialist, U.S. Govt., Office of Housing Expeditor (Res., 4801 Connecticut Ave., N.W.), Washington 8, D.C.

BROWN, HERSCHEL BAST (Assoc. M. '47) Civ. Engr., City Engineers Office, City of Los Angeles, Room 555, City Hall, Los Angeles (Res., 1645 East 3d St., Long Beach), Calif.

BROWN, JAMES HENRY, JR. (Jun. '47) Engr., Anderson-Nichols & Co., 53 State St., Boston (Res., 5 Gerry St., Cambridge), Mass.

BULLARD, JOHN CARSON (Jun. '47) Special Training Program, State Dept. of Highways, Richmond, Va. (Res., P.O. Box 86, De Funiak Springs, Fla.)

BYRKIT, EDMUND JOHN (Jun. '47) Instr. in Civ. Eng., Thayer School of Eng. Dartmouth College (Res., 8 School St.), Hanover, N.H.

CAHILL, RICHARD FRANCIS (Jun. '47) Vice-Pres., Cahill Constr. Co. Inc., 206 Sansome St., San Francisco, Calif.

CAMPBELL, CHARLES CLEVELAND (Jun. '47) Field Engr., Marshall & Brown, 114 West 10th St., Kansas City, Mo.

CANDEE, HENRY BENHAM (Assoc. M. '47) San. Engr., U.S. Veterans Administration, Munitions Bldg., Washington, D.C. (Res., 5700 North 26th St., Arlington, Va.)

CANDLER, THOMAS EDWARD (Jun. '47) Constr. Engr., Candler & Bass, Inc., 8145 Medina, Detroit 17, Mich.

CARBONELL, MARTIN (Assoc. M. '47) Engr. Head, Revetment Section, Dept. of Army Corps of Engrs., Foot of Prytania St. (Res., 464 Glendale Blvd.), New Orleans 20, La.

CARLTON, PAUL FLEMING (Jun. '47) Engr. Insp. II, State Highway Dept., 329 South Kirkwood Rd. (Res., 137 Girard Place), Kirkwood 22, Mo.

CARTER, HARRY THOMAS (Assoc. M. '47) Asst. Bridge Engr., State Div. of Highways, P.O. Box 1499, Sacramento (Res., 2929 Del Paso Blvd., North Sacramento), Calif.

CASEMAN, AUSTIN BERT (Jun. '47) Graduate Asst., Utah State Agr. College (Res., 229 North 1st East), Logan, Utah.

CASTRO, ALEX JOSEPH (Jun. '47) Structural Designer, Detailer, Howard, Needles, Tammen & Bergendoff, 55 Liberty St., New York (Res., 29 Palisade St., Staten Island 5), N.Y.

CATALANO, MICHAEL LINCOLN (Jun. '47) 3425 Hillcrest Drive, Los Angeles 16, Calif.

CAUSEY, MALCOLM LANDER, JR. (Jun. '47) Detailer, Tennessee Coal, Iron and R.R. Co., Ensley Div. (Res., 2801 Ensley Ave.), Birmingham 8, Ala.

CERMAK, JACK EDWARD (Jun. '47) Instr., Civ. Eng. Dept., Colorado Agr. and Mech. College (Res., 805 Elizabeth), Fort Collins, Colo.

CHILSON, MURRAY ALAN (Assoc. M. '47) Real Estate Service Representative, The Port of New York Authority, 111 Eighth Ave., New York (Res., 1655 Fifty-fifth St., Brooklyn 4), N.Y.

CLANTON, WILLIAM RALPH (Jun. '47) Civ. Engr., Power Constr. Div., Tennessee Valley Authority, P.O. Box 1039, Jackson, Tenn. (Res., Route 2, Elkmont, Ala.)

CLARK, FLETCHER, III (Jun. '47) Asst. Engr., Turner Constr. Co., 38 Newbury St., Boston (Res., 10 East Grove St., Middleboro), Mass.

CLARK, LLOYD KIMBALL (M. '47) Project Mgr., Sanitation Research Project, Assn. of Am. R.R., 1103 W. Pratt St., Baltimore 23, Md.

CLARK, SIDNEY WARREN (Assoc. M. '47) Design Engr., Aetna Steel Co., P.O. Box 3275 (Res., 2644 Park St.), Jacksonville, Fla.

CLARKE, CHARLES EDWIN, JR. (Jun. '47) Instrumentman, State Highway and Public Works Comm., Wilson (Res., Box 302, Kenly), N.C.

CLEARY, PAUL GERARD (Jun. '47) Field Engr., Thomas O'Connor & Co., Inc., Manatiquot St., Weymouth, Mass.

CONANT, JOHN HEYWOOD (Jun. '47) Junior Engr., Shell Oil Co., Inc., Wood River (Res., 301 Scott St., Edwardsville), Ill.

CONWELL, LEO ROY (Jun. '47) Asst. City Engr., City of Manhattan, City Bldg. (Res., 405 Vattier), Manhattan, Kans.

COOK CLYDE EDWARD (Jun. '47) Sales Engr., Lone Star Cement Corp., 1415 Merchants Bank Bldg. (Res., 305 Harris Ave.), Indianapolis 22, Ind.

COOPER, ROBERT GEORGE (Assoc. M. '47) Supt., Eng. and Utilities Dept., City Hall (Res., 16 West Knapp St.), Rice Lake, Wis.

CORSO, JOSE MARIA (Jun. '47) Student, Graduate School of Eng., Harvard Univ. (Res., 10 Humboldt St.), Cambridge, Mass.

CREDLE, EDWARD CECIL (Jun. '47) Junior Engr., Jackson & Moreland, Engrs., Care, Central Vermont Public Service Co. (Res., 9 Spellman Terrace), Rutland, Vt.

CROWDER, CHARLES CLIFTON (Jun. '47) Trainee for Asst. Res. Engr., State Highway Dept., Highway Dept. Bldg., Richmond (Res., 620 South Main St., Blackstone), Va.

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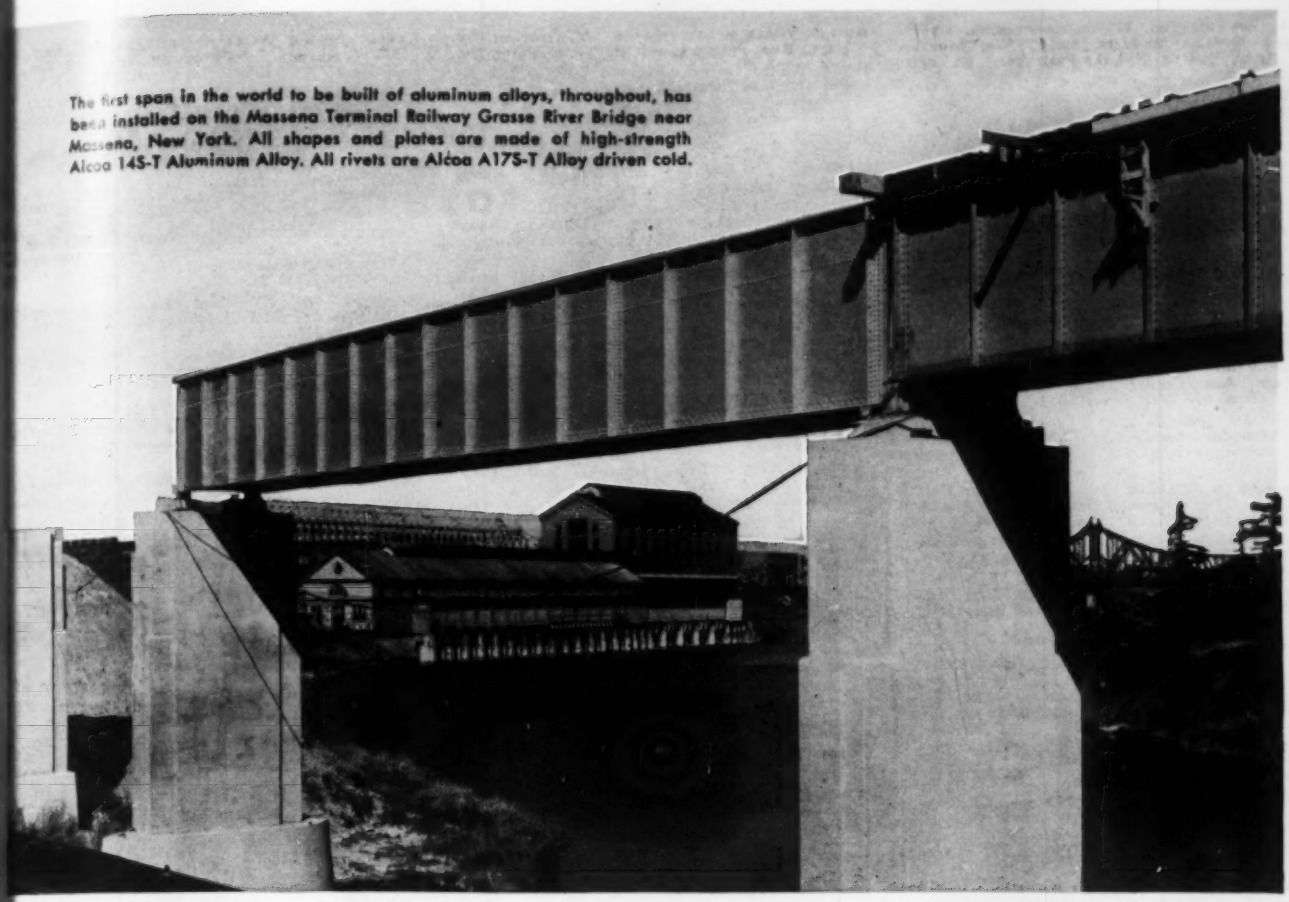

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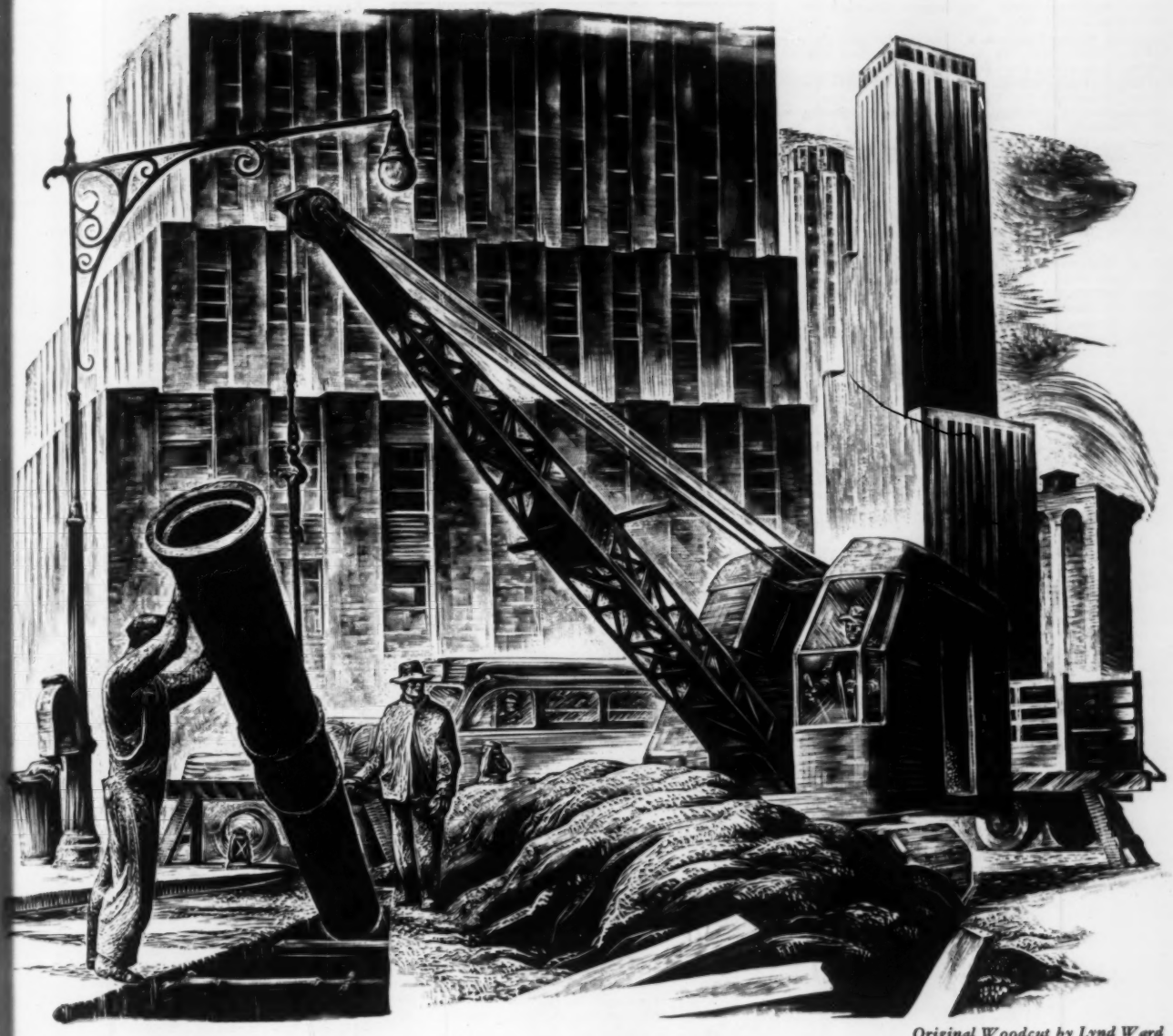

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(December 9, 1946	21,216)

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(*Continued on page 96*)

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ENGINEERS, 21–40. (*a*) Steel and concrete detailers, young; structural designers; estimators; architectural draftsmen. Some of these positions will lead to field supervision duties. (*b*) Chief Draftsman with architectural and engineering background. Apply by letter stating education, experience, salary requirements and date available. Location, Southwest. Y-55.

CIVIL ENGINEERS, young with some construction or office experience, for big contracting firm. Salary, about $4,800 a year. Location, West Virginia. Y-57.

ENGINEER, civil or mechanical graduate, young, with water works experience, for field hydraulic surveys of municipal water works. Considerable traveling, with various headquarters in United States. Salary, $4,000–$5,000 a year. Y-60.

ASSISTANT PROFESSOR, with master's degree or equivalent experience or Associate Professor with master's degree plus considerable experience, to teach surveying, mechanics, strength of materials, water supply and sanitary engineering. Salary, $2,600–$3,400. Location, Vermont. Y-72.

ASSISTANT ENGINEER, under 45, degree in civil or mechanical engineering preferred, with 2 years' experience in building, construction, designing, machinery, refrigeration, etc. Professional Engineer's certificate in New York State helpful. Considerable amount of drafting. Should have ability to write orders, specifications, etc. Must pass a rigid medical examination. Salary, $3,640 a year. Resident of Metropolitan New York. Location, New York Metropolitan Area. Y-76.

CIVIL OR ARCHITECTURAL ENGINEER, 22–28, graduate, to design service stations, warehouses, office buildings and other small buildings. Make hydraulic calculations and design pumping and pipeline installations. Write contracts, specifications and requisitions for materials. Estimate costs on all construction jobs; handle office correspondence relating to requisitions; make economic studies of bulk plant design and location; supervise and layout miscellaneous small construction jobs at bulk plants. Will be required to train Nationals. Will be required to learn Spanish. Single status for 30 days. Salary $5,640–$7,300 a year. Location, Venezuela. Y-86.

CONSTRUCTION SUPERINTENDENT, not over 40, chemical or civil graduate, with some experience in the construction of chemical plants. Temporary location, Pennsylvania. Later retained as general maintenance and construction engineer with headquarters in New York, N.Y. Y-87.

ENGINEERS, under 45, preferably with rural experience, interested in working as consultant, independently or with a group and adaptable to local conditions in India. (*a*) Watershed Planner with hydroelectric and irrigation experience, to plan projects, industries, relocation of people, soil conservation and agricultural development. (*b*) Architectural or Civil Engineer with building material and construction experience to improve village living and economic conditions. (*c*) Agricultural Engineer with research and equipment experience to improve agricultural implements, animal powered equipment and irrigation work. (*d*) Agricultural Supervisor and Rural Planner, preferably with county agent or co-operative experience to demonstrate improved methods of farming, soil conservation, afforestation, animal husbandry and generally improved sanitary and living conditions. (*e*) Village Planner with city or village planning and housing experience, to plan redevelopment of existing communities with regard to housing, sanitation, water supply and general municipal facilities. Positions start about May 1, 1948. Salary $7,500–$10,000 a year with transportation, one-month annual leave. Three-year government contract. Location, India. Y-111.

SUPERINTENDENT OF CONSTRUCTION, with minimum of 5 to 10 years' experience on road construction. Must report single status. Salary $8,400 a year. Location, New Guiana. Y-114.

ENGINEERS. (*a*) Assistant Chief Engineer, under 50, civil, with experience in soil mechanics and foundation work for piers and abutments for railroad bridges. Salary, $10,400 a year. (*b*) Bridge Designer with experience in a state highway department desirable. Salary, $8,000 a year. (*c*) Tunnel Designer, with experience in the design and timbering of railroad and highway tunnels. Salary, $8,000 a year. (*d*) Superintendent of Construction with experience in soft ground tunnel work. Salary, $8,000 a year. (*e*) Area Manager, civil engineer with minimum of 20 years background in general construction to co-ordinate various field jobs. Salary, $12,000 a year. Subsistence and quarters furnished for $1.25 a day. Location, Greece. Y-116.

(*Continued from page 94*)

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DISKINE, JAMES ANCONA (Jun. '35; Assoc. M. '47) Asst. Bridge and Building Engr., Gulf Mobile and Ohio R.R. Co., 104 St. Francis St., Mobile, Ala. (Res., 2134 West 109th St., Chicago 43, Ill.)

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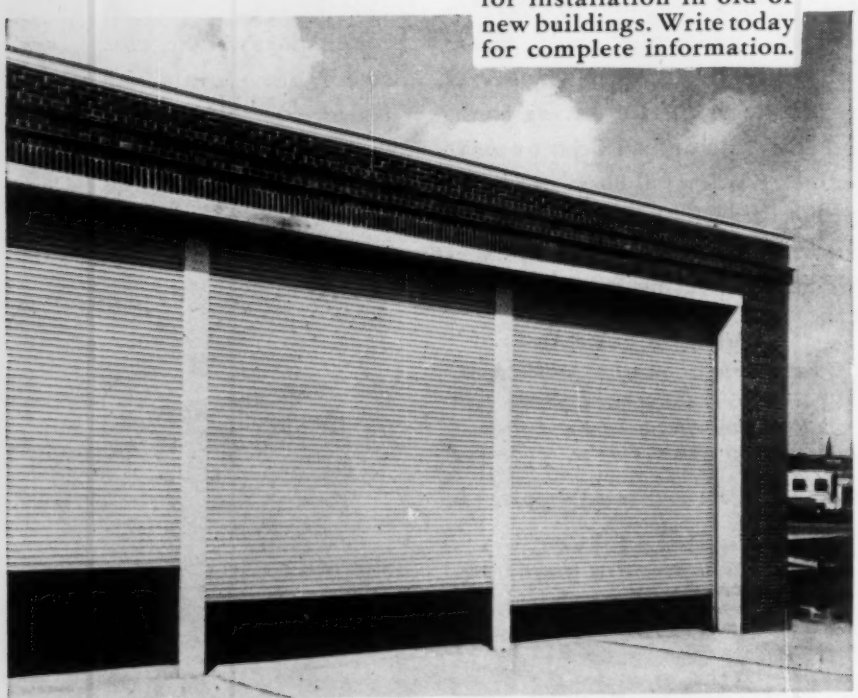

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HIGHTOWER, CHARLES LEE, JR. (Jun. '38; Assoc. M. '47) Bridge Designer, State Highway Dept., Bridge Div. (Res., 3314 Coles Rd.), Columbia 67, S.C.

HOLMES, JOSEPH MARK (Jun. '34; Assoc. M. '37, M. '47) Cons. Engr., Kanab, Utah.

HOWE, WARNER (Jun. '41; Assoc. M. '47) Structural Engr. (Gardner & Howe), 76 Porter Bldg., Memphis, Tenn.

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SMITH, EDWARD EPHRAIM (Assoc. M. '38; M. '47) Gen. Supt., Dept. of Water and Sewage Treatment, City of Lima, 119 West High St., Lima, Ohio.

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WOLF, HERBERT CHARLES (Jun. '38; Assoc. M. '47) Administrative Engr., Russell & Axon, Cons. Engrs., 408 Olive St., St. Louis (Res., 6216 Dexter, Affton 23), Mo.

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ZABRISKIE, JOHN HOWARD (Jun. '35; Assoc. M. '47) Asst. Engr., Dept. of Army, R. and H. Div., 120 Wall St., New York (Res., 35-63 Eighty-ninth St., Jackson Heights), N.Y.

ZAPP, LLOYD OTTO (Jun. '34; Assoc. M. '47) Asst. Div. Civ. Engr., Humble Oil and Refining Co., P.O. Box 1271, Corpus Christi, Tex.

Reinstatements

BLOMGREN, WALTER EDWARD, M., Asst. Director, Region 7, Bureau of Reclamation, 314 U.S. Custom House, Denver 2, Colo., readmitted Oct. 20, 1947.

DUNGAN, RICHARD MELBURN, Affiliate, Care, B-D-R Eng. Corp., 14th and Howell, North Kansas City, Mo., reinstated Jan. 1, 1948.

HUSBAND, ALEXANDER CHAPMAN, Assoc. M., Comdr., CEC, U.S.N., Bureau of Yards and Docks, Office of Superintending Civ. Engr., Room 306, 1212 Lake Shore Drive, Chicago 10, Ill., reinstated Nov. 24, 1947.

KEITH, WARREN GRAY, Assoc. M., Asst. Prof., Dept. of Civ. Eng., Univ. of Alabama, Box 2045, University, Ala., readmitted May 19, 1947.

MIMS, STALEY WOOD, Assoc. M. (Mims Eng. Co.) (Res., 103 Lazy Lane), Crockett, Tex., reinstated Nov. 18, 1947.

NELSON, HERBERT WILLARD, JR., Jun., Apt. L, 5218 One Hundred and Tenth N.E., Kirkland, Wash., reinstated Dec. 2, 1947.

NEVE, HENRY LYNN, M., Head of Design Unit, South Platte River Dist., Region 7, U.S. Bureau of Reclamation, Bldg. 11, Denver Federal Center (Res., 1225 Colorado Blvd.), Denver, Colo., readmitted Oct. 20, 1947.

PAUL, VIVIAN GAINES, JR., Jun., Rodman and Chairman, Chester F. Wright, Engr., P.O. Box 967 (Res., 1224 South "N" St.), Lake Worth, Fla., reinstated Dec. 2, 1947.

REDD, CARL LEITNER, M., Associate Engr., Van Rensalaer P. Saxe, Cons. Engr., 100 West Monument St., Baltimore (Res., Shawan Rd., Cockeysville), Md., readmitted Oct. 20, 1947.

SCOTT, JAMES MORRISON, Jun., 104 Bartley Road, Pittsburgh 16, Pa., reinstated Nov. 4, 1947.

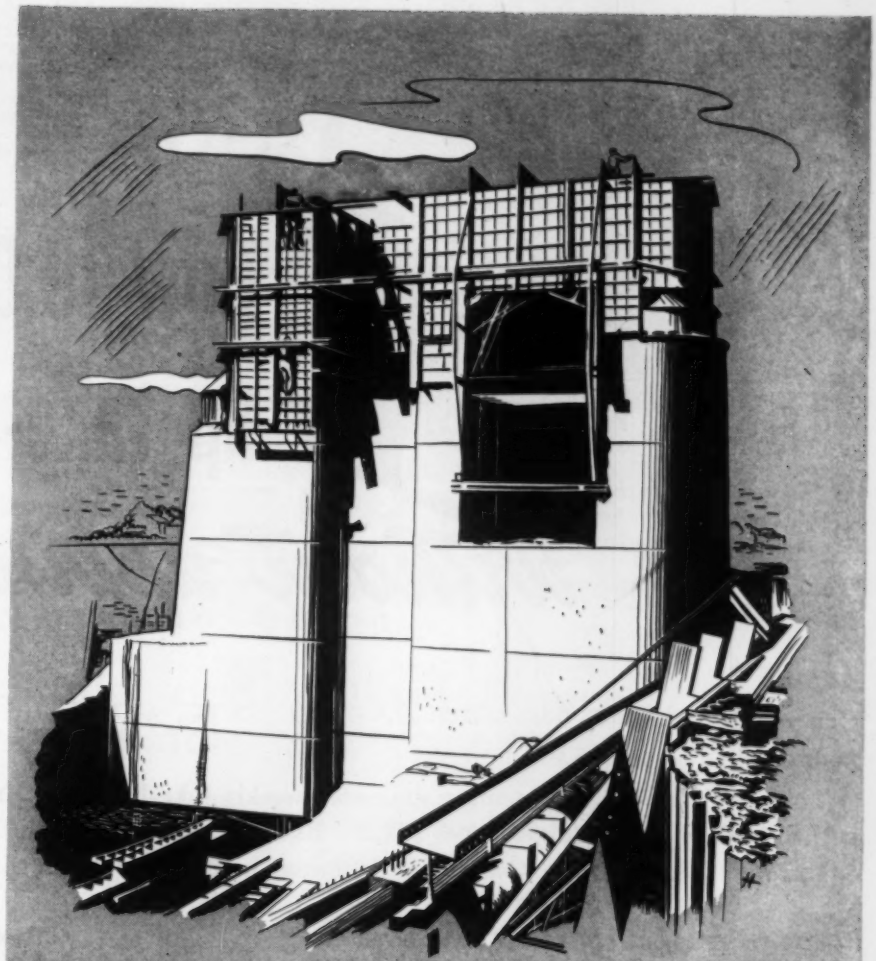
SMITH, MORTIMER WILSON, JR., M., Engr., Public Service Commission of West Virginia, Capitol Bldg., Charleston (Res., 100 Alexander Ave., Clarksburg), W.Va., readmitted Oct. 20, 1947.

STEVENSON, HOMER EADS MACGREGOR, Assoc. M., Dist. Engr., Socony-Vacuum Oil Co. of Venezuela, Apartado 246, Caracas, Venezuela, reinstated Dec. 2, 1947.

SYLVESTER, WILLIAM LAPP, Assoc. M., Senior Civ. Engr., City of New York Dept. of Public Works, Municipal Bldg. (Res., Hotel Latham, 4 East 28th St.), New York 16, N.Y., reinstated Nov 12, 1947.

THOROUGHMAN, FRANK MARION MATHEWSON, Assoc. M., Engr., Corps of Engrs., Upper Mississippi Val. Div., 746 U.S. Court House and Custom House (Res., 4401 Athlone Ave.), St. Louis 15, Mo., readmitted Oct. 20, 1947.

THE END



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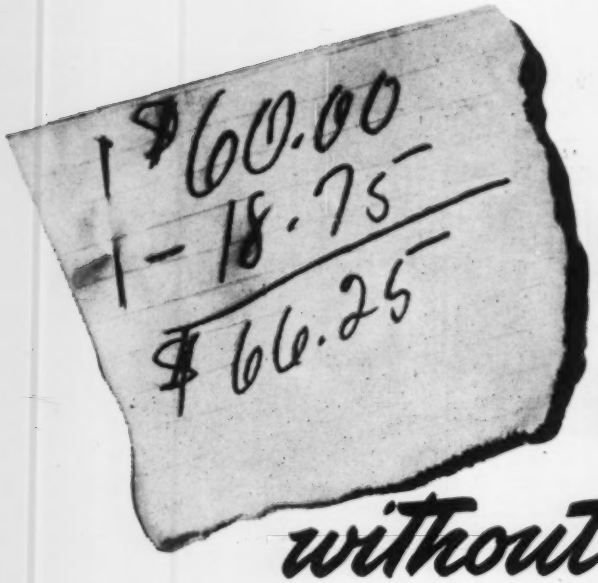

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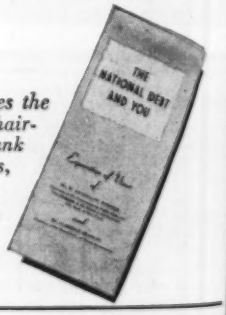

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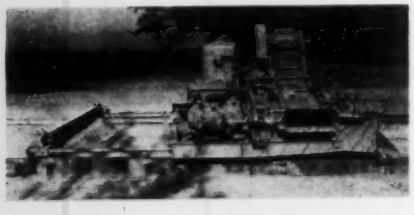

All necessary corrections to the subgrade are made before the strike-off passes over the grade. Fines for filling any small hole or irregularity, and to complete the final screeding-in operation, are provided by small vertical openings in the cutter assembly. The vibration of the soil-covered cutter assembly sifts only fine material through these openings and feeds the material to the strike-off on the same principle as a vibrating screen. **Blaw-Knox Company-Blawknox, Pa.**

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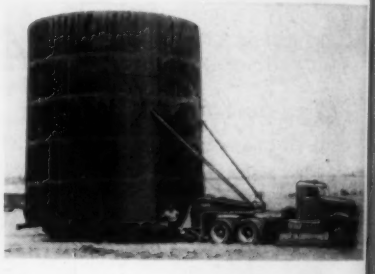
Carryall Truck

A 50-TON CARRYALL with 16 tires was used by Kissick Transporation Co., Belle Fourche, S.Dak., to move this huge tank from Belle Fourche to a point in Wyoming 20 miles away. Measuring 34 ft high with



a diameter of 28 ft and weighing 25 tons, the tank was too big for rail movement and the hauler had to build a temporary road two miles across the Belle Fourche River. The tractor was a White powered by a Cummings diesel. **Fruehauf Trailer Co., Detroit, Mich.**

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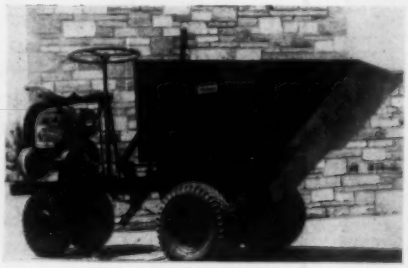
are mounted beneath the truck platform, thus effecting substantial space savings. The unit extends only 40 in. behind the truck cab, leaving ample space for the transporation of men, tools, and materials and is 38 in. high. The assembly is recommended especially for pipe line, public utility, railway, mining and airport maintenance use as well as for general construction applications. **Davey Compressor Co., Kent, Ohio.**

Power Buggy

THE WHITEMAN POWER BUGGY is a sturdy motorized wheelbarrow and dump-truck for hauling anything: wet concrete dirt, bricks, grain, ore, castings, tools, or refuse. It hauls 2000 lb or 12 cu ft at speeds from 2 to 15 miles per hr, forward, or reverse; goes up a 25° ramp with a load turns in its own radius; goes through doors and narrow passages and is even fitted with a hitch for light tractor use. The

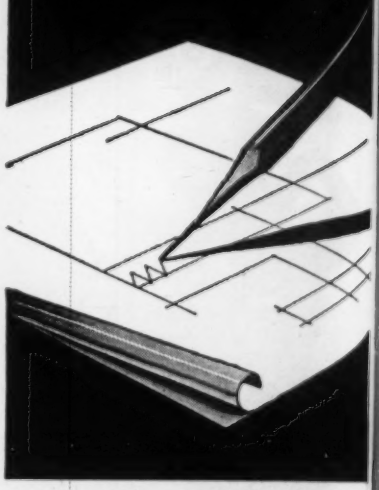


Power Buggy, with single wheels is only 28 in. wide, with dual wheels is 36 in. wide. Tires are standard wheelbarrow tires. Rear wheel drive and full 360° rotating drive mounting make it easy to turn in its own radius or to reverse. Power is provided by a 6-hp, 4-cycle, air-cooled gasoline engine with an automatic clutch and variable speed changer through worm gear reducer. Its light weight (750 lb), high maneuverability and narrow width adapt it for scaffold and upper story work. The bucket height of 34 in. enables it to load at most concrete mixers without pit or platform. **Whiteman Manufacturing Company, Los Angeles 26, Calif.**

Offset Strainer

AN OFFSET SINLEX STRAINER has been developed to permit the strainer to be completely drained as the line itself is drained. With the inlet and outlet at right angles the unit can be installed to form a right angle connection in a piping system. The basket and basket chamber can be made to any length, depending upon the amount of entrainment in the stream. Cover is removable for lifting out the perforated strainer basket. A cleanout plug is furnished to permit steam blowdown cleaning when practical. The strainer is made in cast bronze, steel, semisteel, or iron, or alloyed metals for corrosion resistance. Types are available for working pressures from 125 to 300 lb in sizes from $1\frac{1}{2}$- to 12-in. flanged, screwed, or welding connections. **J. A. Zurn Mfg. Co., Erie, Pa.**

TRACING CLOTH for HARD PENCILS



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40-Ft Crane Truck

A NEW CRANE TRUCK with a full 40-ft reach has been announced. Designed especially for use in the construction and maintenance of high buildings, it is also valuable in lifting material into and out of excavations; loading and unloading ships and rail cars; maintenance and construction of railways; and odd hoisting and transporation jobs in yards, depots, and out-of-doors storage areas.

The 40-ft boom is constructed in 10-ft sections. The center sections can be removed to provide 20- and 30-ft booms when longer lengths are not needed. The capacities of the boom at full length are: 4,500 lb at a 7-ft outreach, 3,620 lb at 9 ft and 2000 lb at 19 ft. At its shortest length, the boom has a capacity of 10,000 lb. The crane truck weighs 19,880 lb; has a balancing point at the 19-ft outreach of 7,125 lb; has electric elevating and boom-ing limit controls; is equipped with 22 in. diameter by 10-in. wide traction and trailer tires; has a 270-deg steering range; is equipped with outriggers on both sides for hoisting capacities up to 10,000 lb; and has a lazy arm boom-stop to prevent loads from swinging past the pivot point of the boom. **Yale & Towne Mfg. Co., Philadelphia Div.**

Rotary Snow Plow

A ROTARY SNOW PLOW, called the SnoMaster, is a self-contained unit which can be attached to or detached from almost any 2½ to 5-ton four-wheel drive truck. There is no extra power unit to mount and no special transmission is required.

The SnoMaster can be used to open drifts of any depth, in snow of any consistency—wet or dry, soft or frozen. Rotary picks driven by chains and suspended by springs in front of the plow can be raised or lowered by hydraulic controls in the truck cab to break down drifts or cut away frozen snow on the ground. The 18-in. auger is ball-bearing mounted and is driven through a shear pin flange for safety. Rotor is a disk with six blades of special steel and provided with a shear pin. An 8-cylinder, 114-hp engine equipped with starter and generator supplies the power. Drive is through fluid drive and flexible coupling. Transmission is in a compact, oiltight case. A specially designed chute, controlled from the operator's cab, will throw the snow to the right or left. A removable loader hood at the top of chute, also controlled from the cab, can be adjusted so the snow can be blown way off the road or airport runway or directly into trucks when cleaning city streets.

The SnoMaster weighs approximately the same as a heavy-duty push plow so it can be quickly interchanged with one-way or V-plow by using the same attachments. This makes it possible to get double duty from your trucks without a major operation. **Iowa Manufacturing Co., Cedar Rapids, Iowa.**

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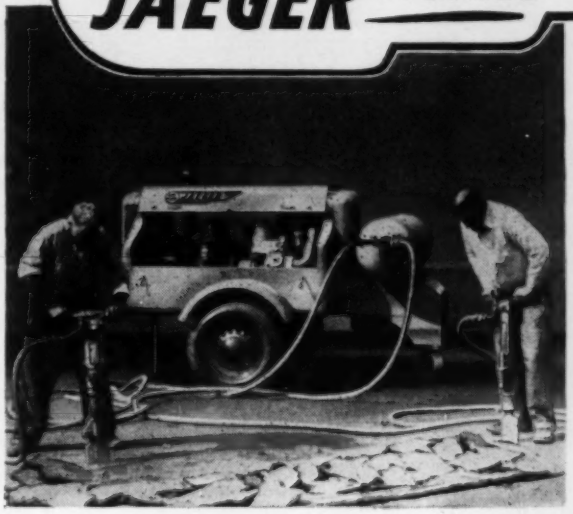

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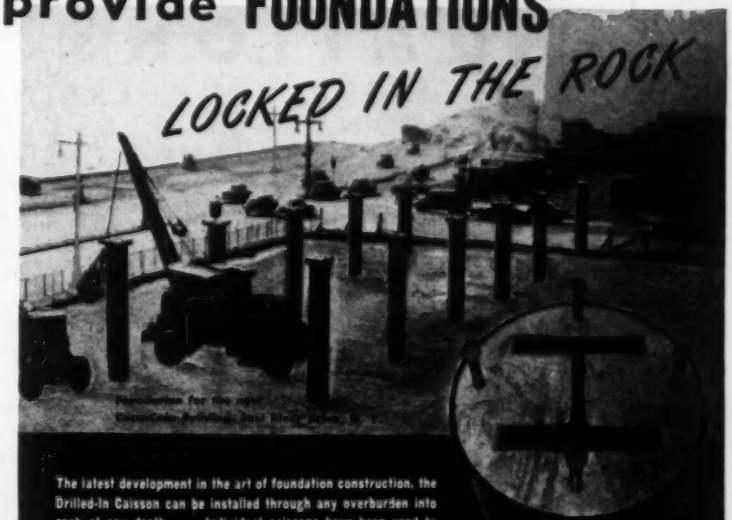

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The picture shows a partially completed 40' diameter, 110,000 gallon pre-stressed "GUNITE" tank with a "GUNITE" dome roof, designed and built by us.

When this photo was made the tank was filled with water for leakage test. After the test showed the tank to be bottle-tight, two inch mesh reinforced "GUNITE" was placed over the outside to permanently protect the pre-stressed hoop rods. The tank was subsequently covered with earth, with 12" of fill over the dome.

This photo illustrates our method of pre-stressing the hoop rods by means of several turnbuckles in each hoop.

Our Bulletin B2300 describes and illustrates prestressed "GUNITE" construction in detail and also scores of other uses of "GUNITE."

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Literature Available

PRECISION PRODUCT BULLETIN—Bulletin #10,000 gives descriptions and illustrations of all Falk precision products such gears and speed reducers, motoreducers, couplings, high-speed drives, backstops, marine drives and special gear drives. Available services and facilities including steel casting, maching weldments, and engineering are also described. **The Falk Corp., Milwaukee, Wis.**

PHOTOGRAPHIC PAPER FOR REPRODUCING—Kodagraph Autopositive Paper, a revolutionary silver-sensitized paper for reproducing engineering drawings is described in a new, eight-page pamphlet. Designed for use in normal room illumination with standard blueprint or direct process printers, Kodagraph Autopositive Paper produces a high contrast positive copy directly from a positive original. The booklet describes the use of the paper for such problems as reproducing opaque drawings, worn, stained, or discolored tracings, or direct process prints or blueprints. **Industrial Photographic Div., Eastman Kodak Co., 343 State St., Rochester 4, N. Y.**

VAPOR SAVING SYSTEM—The method of determining which of the flat-bottom tanks in a vapor-saving system to equip with a lifter-roof and the method of computing the correct sizes of vapor lines connecting the tanks is described in a new 12-page booklet. The vapor pressure of the stored product, the expansion of the air-vapor mixture, and the flow of vapor in the vapor lines can be read directly from the charts and tables included in this booklet. The details of the Horton Liquid-Seal Lifter Roof tank are shown in several elevation, plan, and sectional drawings. A typical vapor-saving system, including three cone roof tanks and one Horton Lifter-Roof tank, is shown in a diagrammatic sketch supplemented with the necessary calculations for designing the system. **Chicago Bridge & Iron Co., Chicago, Ill.**

ARC WELDERS—A 36-page, 3-color catalog, now available, contains illustrations, descriptions, dimensions, and specifications on its complete line of "Simplified" arc welders which includes electric motor-driven d.-c. welders in 5 sizes from 150 to 600 amp; gasoline engine-driven welders in 4 sizes from 200 to 600 amp; a.-c. transformer-type welders in 3 sizes from 200 to 500 amp; welding generators only in 4 sizes from 150 to 400 amp; gasoline engine-driven welders with auxiliary a.-c. or d.-c. power generators; and other models in all sizes for special arc-welding applications. Various features comprising the machines are individually illustrated and described, and helpful information is given for various welding problems. Also listed is the complete line of Hobart arc welding electrodes and accessories. **Hobart Bros. Co., Troy, Ohio.**

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Literature Available (Cont.)

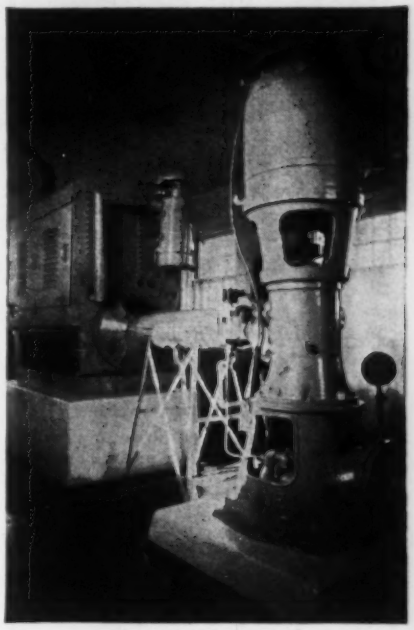
WATERPROOFING—In correction of a news release of literature available appearing in the November issue of CIVIL ENGINEERING, a 12-page booklet describes a process of waterproofing leaky basements, etc., from inside against hydrostatic pressure. Instead of being offered by Stix, Baer & Fuller Drygoods of St. Louis, that company had its basement waterproofed by this process 32 years ago and it is resisting a 7-ft head pressure 35 ft below the basement floor. The booklet is offered by **Ranetite Mfg. Co., Inc., 1917 South Broadway, St. Louis, Mo.**

PRESSURE AND LEVEL CONTROL CATALOG—The Kontrol Motor line of pressure regulators and diaphragm motor valves is described in a new 100-page catalog. The equipment illustrated capitalizes fully on production methods evolved since the war, and several units shown are said to represent the greatest advances in equipment of this type in the last 50 years. The new catalog is made up of five sections covering in addition to diaphragm valves, liquid level controllers, strainers, pressure reducing and regulating valves, pump governors, and such steam plant equipment as back pressure valves, atmospheric relief valves, diaphragm relief valves, oil and grease extractors, and exhaust heads. No broadcast distribution is planned for the catalog No. 47, but copies are available for steam plant and process industry engineers designers, and purchasing personnel, on request. **Kieley & Mueller, Inc., North Bergen, N. J.**

SELF-PRIMING PUMP—An automatic, self-priming pump equipped with a new type automatic spring valve which is said to give faster, smoother transition from priming or vacuum pumping to straight centrifugal action, is described in an eight-page illustrated bulletin. According to the bulletin, the pump's portability, rapid installation, quick priming features and the non-clog design of its open impeller types, make it a valuable tool in almost every industry. It is adaptable to any drive and is available in five sizes to cover ranges and conditions diagramed in bulletin No. 08B6319B, **Allis-Chalmers Mfg. Co., Milwaukee, Wis.**

TERRA-COBRA--EARTHMOVER—Improved operation and construction features of the Wooldridge Terra-Cobra high-speed self-propelled earthmovers are fully illustrated and described in a 12-page bulletin. Descriptive data is combined with on-the-job photographs to show engineers, contractors, and equipment owners how Wooldridge Terra-Cobras are used to gain greater yardage profits in earthmoving operations. The positive two-wheel hydraulic steering action, pioneered by Wooldridge five years ago, plus the flexibility articulated oscillating kingpin pivot are among the features covered in detail by the bulletin. **Wooldridge Mfg. Co., Sunnyvale, Calif.**

IN CASE OF
Power FAILURE



The city of Margate, New Jersey no longer worries about an unforeseen powerline failure. Their newly installed million gallon per day Layne Well Water System is DUAL POWERED. Should the power fail and the electric motor "go dead" a big husky gasoline engine takes over to keep up water production.

Margate's new dual powered water system is a quality installation throughout with the very latest Layne developed control and engineering features. And like two other Layne installations for Margate—one of which is over 23 years old, this new unit will also give years and years of satisfactory operation.

Layne Well Water Systems whether installed for cities, factories, railroads, irrigation projects or other use, keep water production at the very lowest cost. Furthermore Layne associated companies constantly provide prompt repair and parts service for their Layne installation. For late catalogs, address Layne & Bowler, Inc., General Offices, Memphis 8, Tennessee.

LAYNE
WELL WATER Systems

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La., * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Pacific, Inc., Seattle, Wash. * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Minnesota Co., Minneapolis, Minn. * International Water Supply Ltd., London, Ont., Can. * Layne-Hispano Americana, S. A., Mexico, D. F.

AUTOMATIC
Sewage Regulators

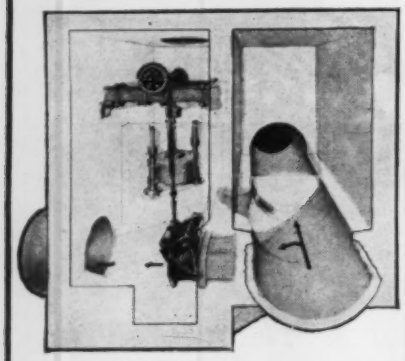


Fig. B-19

Automatic Sewage Regulators control sewage flows either by partially or completely cutting off such flows to suit head or tail water conditions or by "governing" to discharge a predetermined quantity regardless of head or tail water conditions.

Descriptive Bulletins and Engineering Data Available Upon Request.

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Literature Available (Cont.)

WELDING BULLETINS—Two recent bulletins are now announced as special reprints. Entitled "Arc Welding Problems Successfully Solved," one bulletin covers welding cast-iron, low- and high-alloy steels, stainless steel and tool steels to high-carbon steels; welding special manganese parts, elimination of undesirable characteristics, and other problems occurring in everyday welding. Twelve production case histories are presented. The other bulletin, "Another Major Advance in Gas Welding" describes the use and applications of various new developments in the field of special flux-coated alloys known as EutecRods, for steel, cast-iron, brass, and aluminum. Correct welding procedures, together with physical properties, charts, and valuable technical data are outlined and illustrated. Applications discussed include steel, cast-iron malleable, bronze, brass, and copper. **Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N.Y.**

SHOVEL, CRANE, AND DRAGLINE—A 24-page bulletin now offered contains a complete detailed description of the Lima Type 604 shovel, crane, and dragline. Many illustrations are contained in the new bulletin showing details of construction and operating advantages including the application of "precision" air control. Liberal space is given to specifications, capacities, and working ranges. As a shovel the Type 604 has a capacity of $1\frac{1}{2}$ cu yd; as a dragline, variable. **Lima Shovel and Crane Div., Lima-Hamilton Corp., Lima, Ohio.**

PORTABLE SAW—The new, lightweight, model No. 1 Timberhog gasoline-driven chain saw is described in a four-page, illustrated folder. The primary advantages attributed to the Timerhog are: it does all the operations, is five times faster than hand sawing, the horsepower delivers far in excess of load requirements, it is lightweight, low in price, and low in maintenance and operating costs. **Reed-Prentice Corp., C-1, Worcester, Mass.**

SAND, GRAVEL, ORE EQUIPMENT—A 24-page illustrated bulletin is offered on washers and classifiers for metallic and non-metallic ores. Features, general design, and operations are described, pictured, and diagramed. Specific instructions on installation and special equipment are also included in the bulletin. **Eagle Iron Works, Des Moines, Iowa.**

SURFACE PLYWOOD FORMS—A Pamphlet "How to Pour Concrete" describes five reasons for the use of KIMPREG surfaced plywood forms in pouring concrete: namely, increases life of concrete form, produces surface smoothness equal to steel forms, cuts maintenance costs, easily constructed, reduces rubbing. **Kimberly Clark Corporation, Neenah, Wisconsin.**

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Literature of new model polariscope now available

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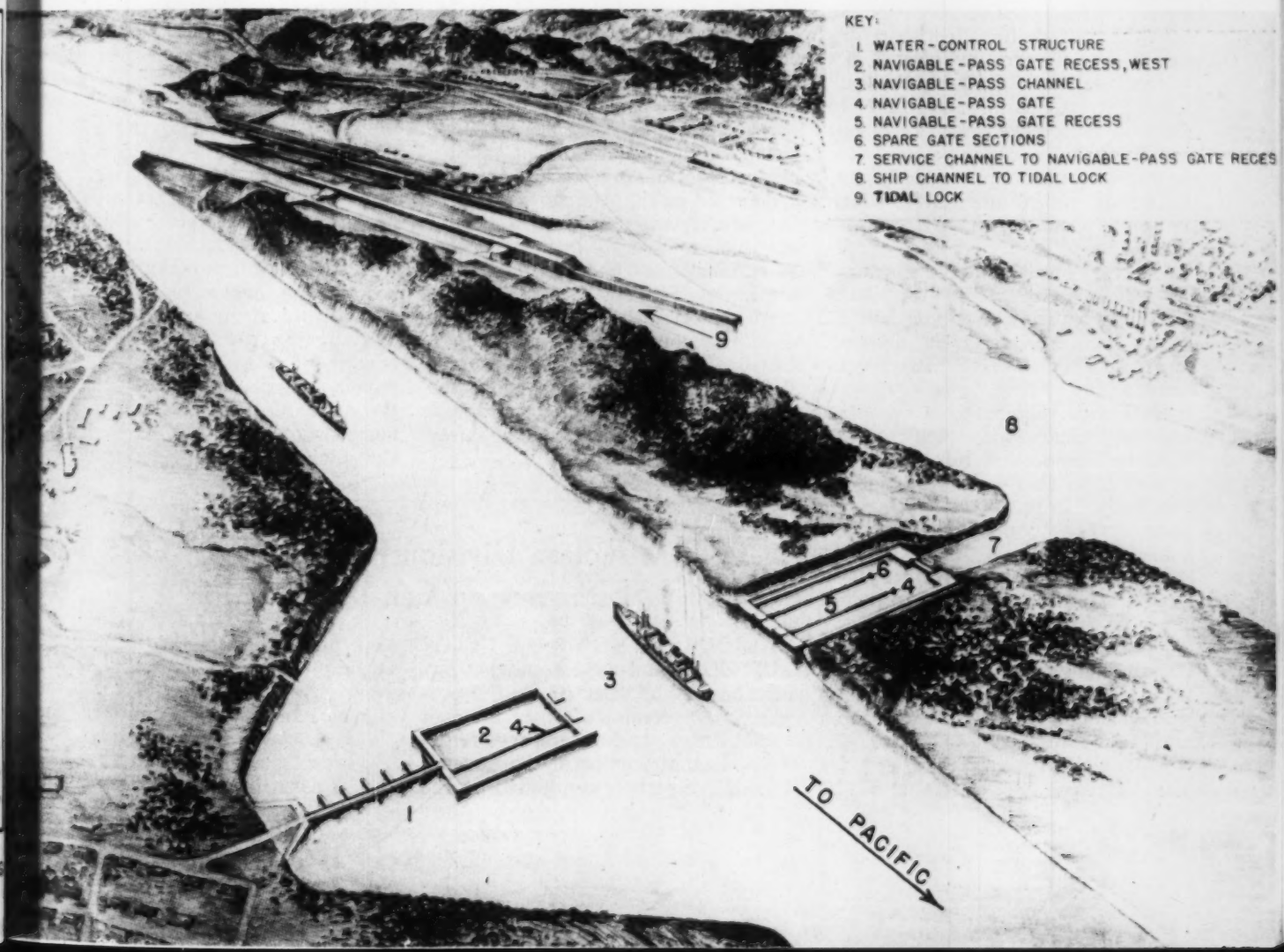
Sea-Level Panama Canal Dictated by New Weapon Dangers

Nine Papers on Panama Canal Presented at Society's Annual Meeting

ATOMIC BOMBING, rockets and guided missiles, for which no "effective resistance" has been developed, present such dangers as to dictate conversion of the lock-and-dam Panama Canal into a sea-level waterway whose chief value would lie in the near-indestructibility of the virtually structureless project.

These facts were revealed in a paper presented at the Society's 95th Annual Meeting by Col. James H. Stratton, M. ASCE, of the Corps of Engineers. As supervising engineer of the Panama Canal Special Engineering Division, he headed the engineering committee authorized by Congress to make a special two-year study of "means for increasing the capacity and security" of the Canal. He spoke at a Wednesday afternoon session devoted to his keynoting of the symposium forming the theme of the four-day meeting, and at ensuing sessions of the Society's Technical Divisions at which first-hand accounts of the study's technical aspects were given by the engineers who made it. The symposium was of special interest to the ASCE, whose members have been closely associated with the development of the Panama Canal since its inception.

"No other site offers advantages comparable with those of the Canal Zone for either a lock or sea-level Isthmian canal," Colonel Stratton said, touching on another phase of the proposal recently placed before Congress by Governor J. C. Mehaffey of the Canal Zone that a ten-year project, estimated to cost $2,483,000,000, be initiated to replace the present destructible lock-and-dam canal with a sea-level route. The Governor's proposal was based on the findings of the Special Engineering Division and a board of consultants made up of members of the American Society of Civil Engineers, and came in a report he filed at about the same time that differences cropped up between the United States and the Panamanian government over leases for Canal defense bases.

"Investigations disclose that only an Isthmian sea-level canal will meet

HOW AND WHY PANAMA CANAL should be converted into sea-level waterway, with present locks and dams eliminated, as means of meeting threat of atomic bomb attack, is central theme of papers presented at 95th Annual Meeting of ASCE in Hotel Commodore, January 23–24. Symposium heard by almost 2,500 attending one of largest meetings in Society's annals is based on two-year study leading to recommendation made recently to Congress by Governor J. C. Mehaffey of Canal Zone, namely, that a ten-year project estimated to cost $2,483,000,000 be initiated to meet future security and capacity demands. Sketch (below) shows proposed tidal locks for largest single construction project in history. Over billion yards of excavation is included in this mammoth undertaking.